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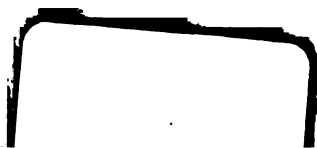
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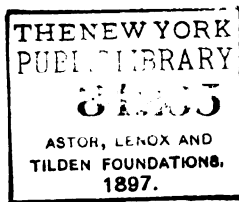
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# The Marine Engineer.

LONDON, APRIL 1, 1889.

THERE is still much to be desired for an approved design of an ironclad, with regard to division into watertight compartments, which shall be effective to prevent foundering in case of the hull being pierced in one or more places. A forcible example of this is the loss of H.M.S. *Sultan*, which struck, while exercising torpedoes, upon a sunken rock in the Mediterranean. It was not thought at first that the hull had sustained much damage, and latterly it had been reported that the water could be kept down by certain pumping appliances. It would seem, then, that the injury must have been in the first case so comparatively slight, that a proper system of watertight compartments would have prevented such an influx into the hull as would have sufficed to prevent foundering. Except in the case of direct collision, where protection is afforded by the collision bulkhead, the assumed protection afforded by general watertight chambers seems to be of no utility. It is a lamentable state of affairs that so valuable a vessel can be so easily lost in fair weather. The vessel, after striking, was lightened as quickly as possible, the stores being removed as far as possible, with a view of lightening the ship, but what could be done in that way was not much, as the coal on board, which formed a large portion of the vessel's weight, was mostly under water. Fortunately all lives were saved, and many of the stores and heavy articles which were thrown overboard will probably be recovered later. The Commander-in-Chief, who was at Gozo, in the yacht *Golden Fleece*, has been concerting active measures with the Admiralty officials to get her off the rocks, but unfortunately a change of weather put a stop for the moment to effective towing, and what is worse, has caused a swell, which, bumping the vessel upon the rocks on which she rests, has probably broken the hull in many places, if much damage had not been previously caused. The *Sultan* now has been driven off the rocks by the heavy sea and she has practically foundered, her upper works alone showing above water. As she is lying broadside to the shore, the vessel is in a very awkward position for towing. No doubt the whole matter will be subjected to rigid official enquiry, and though the question of neglect or otherwise is a most important one, as determining responsibility, we think, to the nation at large, the question whether ironclads are built in a

suitable manner to meet such accidents, is of the utmost importance.

At last the Government seems to be making practical efforts to meet the accumulated criticisms that have lately been persistently urged upon them, both in the House and by well-informed literature, to effect an immediate strengthening of the British Navy. They propose a large supplementary expenditure (about £11,000,000), to be voted for extra construction during the next few years, on completion of which it is supposed that, by the comparison of the regular rates of building in foreign countries, our relative advantage in strength of Navy will be greatly improved. As we have long added our voice to the agitation of this subject, we think that such a course is being taken not a minute too soon. The safety of this nation has ever lain in her command of the seas. Many a threatened invasion has been entirely disconcerted and prevented by the large relative naval power which other nations know we could bring to bear upon any invading flotilla. It has been said of the famous General Von Moltke that he could suggest half-a-dozen ways of invading Great Britain, but cannot devise one safe method of exit so long as we hold command of the seas. An invasion without a possible retreat, in case of misadventure, may be considered an impracticability in modern days, where the method of international warfare is to effect a prompt defeat as quickly as possible, with a monetary settlement and instant retirement. The question of most importance seems to be now whether that which is proposed to be effected by way of increase is sufficient for the purpose, and upon this point there may be very many diverse opinions. We must remember that now that our relations with our Colonies are somewhat of a sensitive character, their loyal adherence will be much affected by the fact that we are in a position to maintain, under our control, the water way, by which alone we can communicate with them, and by which alone we can render them succour and protection, provided our enemies should adopt the policy of attacking us through them. Should an excessive expenditure of even double or treble the present estimated amount serve more completely to settle at once the question of control of the seas, this would be, so far, an insurance against the practicability of a foreign war that could do us any harm, that the money would be well spent. Should the proposed expenditure satisfy this requirement, we should be glad to see it done at a minimum of expense, but if

there is any doubt upon the matter, it would be well to boldly grasp the situation and make arrangements accordingly. Should there be an attempt on the part of foreign nations to rival us in this way, and even to throw out the calculations now made, we have the consolation to know that foreign nations would be competing with us under great disadvantages. In largely increasing our Navy, and particularly as this will be done in considerable degree by private contracts, the expenditure so incurred will indirectly benefit this nation by increasing the labour employed upon this description of engineering manufacture, and it becomes but a transfer or circulation of money from the pockets of the taxpayers generally to the benefit of a particular trade, the money not leaving the country. In the case of our Continental or foreign rivals who would not be in a situation to produce for themselves little, if any, of such proposed increase of ironclads, all purchases effected by them would, in the ordinary way, be effected in England, or if elsewhere, as in the United States, such purchase would become dead payment on their part from their own people to ourselves or others, and this would be a direct drain upon their financial resources. It would also be well for the Admiralty to seize this opportunity to carefully obtain independent criticisms upon our present designs of ironclads, particular regard being had to the new and splendid ironclads lately built by our private firms for foreign nations, so as to seek to obtain by the proposed outlay the best and most efficient vessels for the money. By frankly accepting such a position, the Admiralty would be dealing fairly with the country, and possibly prevent much of the bitter and scathing comment upon the results produced, either as constructions or designs, in an official hole and corner.

WE are glad to note that the early part of the present year has, as yet, shown no cessation of the activity which was so welcome in the shipbuilding and marine engineering trades in 1888. Brisk as has been the delivery of vessels during the past year, there has always been a new keel ready to be laid down as the finished hulls were launched. It is believed that since the beginning of the year nearly 45,000 tons have been ordered. These orders have run pretty generally to large mail vessels and liners from 6,000 tons to 3,000 tons each. Negotiations are pending for the re-opening of shipyards which have lain vacant and closed for many years, and new smithies and boiler-shops are being built or acquired to meet anticipated business.

All this forms a very promising outlook for the present year, particularly as the enormous orders referred to, and anticipations, are distinct from those which may result from the new Naval programme of the Government. It is possible that private owners may be hastening to place their orders with the anticipation that when the Government orders are placed, much delay may be caused before private owners may be able to place their orders with firms engaged upon Admiralty work. That the Government is energetically pressing their intended programme for immediate large Naval construction, is proved by responsible representatives already inspecting iron and steel works with a view to their capacity of receiving large contracts for early delivery. The Staffordshire Iron Works has already received such a visitor, and it would foreshadow the anxiety to place contracts as promptly as possible in consequence of the rise in prices of iron and steel. As we hear, however, that the Staffordshire Iron Works are mostly already very busy with private orders, the result of the increase of contracts will probably be to rapidly raise the prices of iron and steel. It is difficult to imagine that the late heavy demand for steamers of large size can possibly continue at the same rate which has kept the shipyards hitherto so busy, but the normal increase of traffic and modern requirements are often very surprising, and their consequent demand for new and first-class steam-shippping. It is very likely, also, that river and coasting traffic in many of the new countries that are being now so rapidly opened out will contribute largely to the demand for steamers during the current year. The Tyne and Clyde will probably receive the majority of the shipbuilding orders from the Government, whilst it is probable that the Wear and the Tees will also get some share thereof. Sheffield, Scotland, Durham, and the West Coast will probably shortly share in the good things in the shape of orders for armour, steel plates, and angles, so that it is a reasonable anticipation that the extraordinary Government demand, in addition to the many private orders about, will make piping times in the present year, and, we will hope, for some time to come, among the iron and steel manufacturers and shipbuilders.

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A FAST PASSAGE TO INDIA.—The maiden trip of the P. & O. steamer *Oriental*, the latest addition to the already large fleet of this company, has quite realised expectation. This vessel left England on the afternoon of the 16th of February, and arrived at Bombay, Saturday morning, March 9th, 12 days after her departure from Brindisi, with the outward Indian mail of the 22nd ult.

## THE INTRODUCTION AND DEVELOPMENT OF STEEL SHIPBUILDING.—II.

(Continued from page 376, Vol. X.)

THE other doubts or objections already alluded to, as having been urged against steel, viz., those of corrosion and want of rigidity, have been longer persisted in, as it is only by continued experience in actual service that the merits of such questions can be indisputably determined. Through the results of countless laboratory experiments made at an early period in the history of mild steel, supported, as they were, and continue to be, by a preponderance of favourable testimony from the field of actual service, the fears entertained regarding rapid corrosion are now all but completely removed. The broad deduction to be drawn from the whole matter—and one which has received the support of innumerable authorities—is that the deterioration of steel, under the action of sea-water, is no greater than that of iron, and where the same care and constancy in cleaning and painting, common to iron ships, is observed in the case of steel ships, their durability is at least equal—the reduced scantling notwithstanding.

Much of the bad repute of steel for deterioration has been due to one peculiarity, which was early brought under notice. The Admiralty, from their experience in steel, early discovered that when the mill-scale or black oxide, covering the surface of the metal, was not carefully removed before coating ships, galvanic action was set up between this scale and the body of the metal, with the result that serious deterioration did ensue, but where carefully removed before coating, and postponing this work as long as possible, no great corrosion resulted. Exhaustive tests were conducted by various authorities to demonstrate this—amongst others, by the Admiralty, the results of which were given in a paper by Mr. Farquharson, read before the Institution of Naval Architects in 1882; and the importance of allowing steel vessels to remain exposed as long as practicable, and clearing them of scale, as thoroughly as possible, before actual painting, was soon appreciated by shipbuilders. The Admiralty, from an early date, have resorted to the practice of treating all the bottom plating floors and lower plates of bulkheads in a bath of hydrochloric acid to remove the scale from the material before using it in the structure of ships. In carrying out this operation in the six vessels of the *Scout* class, built in 1885, Messrs. J. & G. Thomson, Clydebank, employed a fast-running wire brushing machine of their own invention, which, after the plates had been dipped in the acid bath, burnished their surfaces, and left them smooth and clear. This operation, still used by Messrs. Thomson, is comparatively inexpensive—not costing more than 1s. per ton over the whole of the ship—and it has been recommended that steel manufacturers should carry out this process at their own works for the under-water portion of the shell-plating of ships, in which case it would be still less expensive, and the advantage would be general.

Another method of meeting the corrosion objection to steel, which has been somewhat extensively adopted, is to have all the plates in a ship most exposed to corrosive influence, galvanised. This is especially followed in the case of light draft craft, where the thinness of the material emphasises the need for protective measures. The torpedo boats, built on the Thames by Messrs. Yarrow and Messrs. Thornycroft for a number of years past, having shell plating, varying in thickness from 1-16 to 3-16 in. steel, have the greater portion of their structure galvanised. Referring to this in a letter received by a prominent Clyde shipbuilder in 1884, Mr. A. F. Yarrow wrote:—"As a matter of fact, we very rarely build any very light draft steamers now except of galvanised steel, and, taking them all round, we have no hesitation in saying that in the case of boats built with plates of 1-8 or 3-16 in. thick, galvanising increases the durability two or three-fold." Many of the light draft paddle steamers built for the Irrawaddy Flotilla Co., Limited, by Messrs. Denny, of Dumbarton, during recent years have had almost the whole of the plates and angles in the hull structure carefully galvanised. The floors and lower bulkhead plates of the vessels of the *Scout* class, already referred to, were galvanised, and in large vessels for both Naval and Merchant Service, the floors and inner bottom plates in the way of the boilers (and therefore exposed to the highly-corrosive influence of the heat, moisture, and falling cinders) have been galvanised, with most gratifying results.

As regards the other objection at one time urged against steel ships—viz., that of a want of rigidity, and consequently of

structural strength—very little can be pointed to which justified the complaint. It was freely alleged by certain classes, after steel had been some time introduced, that steel ships were so soft, that when they came alongside wharves or fenders they bent and bulged as if made of indiarubber. This, without doubt, was a gross exaggeration, and whatever measure of foundation in fact the allegation had, it could only have been from very exceptional and isolated instances. Such charges were made so strongly, and caused such commotion in underwriting and shipping circles, even at a time when thousands of tons of steel ships had been built, and were in continuous employment, that the matter was taken up by Lloyd's Register Committee and thoroughly investigated. Speaking of the results of this inquiry at the Iron and Steel Institute Meeting at Glasgow in 1885, Mr. Martell, the Chief Surveyor, said:—"They could find no instance where it could be clearly proved that a steel ship had failed for want of general structural strength. They did find that some few of the steel ships appeared to show sometimes symptoms of local straining, but that was entirely due to the fault of the construction in some way or other. There were omissions and little oversights, where the continuity of the strength was not kept up, where something was not supplied in order to make that continuous strength perfect. They did find some instances of that kind, as he was quite willing to admit, but beyond that he was bound to say, in the cause of steel manufacturers, of those who built steel ships, of the owners, and of the material itself, that that was the extent of his experience up to the present time in regard to the efficiency of steel ships to do the work required of them."

At the Institution of Naval Architects in the following year, the same authority, in a paper upon "The Progress of Mild Steel," said, "As regards the structural strength of steel vessels, if they be faithfully built to the scantlings required by the rules of Lloyd's, there is no reason to apprehend that they are not sufficiently strong, even with the diminished scantlings, to perform all that is required of them in a satisfactory manner. After a careful examination of a large number of steel vessels, classed at Lloyd's, which have from time to time during the last eight years come under my observation, I am strongly of opinion that if vessels are built of this material according to the present requirements, and the workmanship be faithfully executed, and proper attention paid to preserving the continuity of strength, they are capable of performing their work with the greatest efficiency and satisfaction."

All this experience, and the deductions made from it, only verified what has been boldly maintained by those firms who advocated the adoption of steel and employed it largely in building, and by those shipowning companies who had entrusted these same firms with orders for steel vessels, and from actual experience were amply encouraged to continue doing so. Of the shipbuilders who early adopted steel, and have ever since scarcely used anything else, Messrs. Denny Brothers, Dumbarton, are worthy of particular mention. In the year 1879, 57 per cent. of the total tonnage of vessels they built were of steel; in 1880, it was 76 per cent.; in 1881, 80 per cent.; in 1882, 72 per cent.; in 1883, 68 per cent.; in 1884, 100 per cent.; and they have ever since, as in the last case, continued to build exclusively in steel, and to advocate its use in all circumstances. The numerous steel vessels built by Messrs. J. & G. Thomson, of Clydebank, include such vessels as the huge and powerful Transatlantic liners *Serria* and the late *City of New York*, and light river steamers such as the *Columba* and *Grenadier*; the experience embracing many varieties of vessels, and showing that steel ships of all kinds could be built with the reduction in scantling permissible, and be quite as strong and serviceable as iron ships.

Several large shipowning companies were not slow to place faith in the new material. In the early part of 1879 the "Allan Line" Co. entrusted to Messrs. Denny & Brothers, Dumbarton, the order for a huge vessel, which the intrepid confidence of the principal partners in both the owning and the building firms determined should be of mild steel, be bound with steel rivets, and have her boilers of the same material. This was the large steamer *Buenos Ayren*, the first Transatlantic steamer built with the new material. She was finished early in 1880, and had not been over nine months in the water when the order for a second and still larger steel vessel, the *Parisian*, had been given by the same owners to Clyde builders. The Union Steamship Co. of New Zealand, the Pacific Steam Navigation Co., Messrs. Donald Currie & Co., and several smaller companies, ordered vessels of steel almost simultaneously, while yet the new material was in the early stage of trial. Amongst the orders for

steel vessels which were subsequently given, the *Servia* and *Catalonia* for the Cunard Co., the *Clyde* and *Thames* and *Shannon* for the Peninsular and Oriental Co., the *India* for the British India Co., the *Arabic* and *Coptic* for the Oceanic Steam Navigation Co., and the four twin-screw steamers of the "Hill" Line, represent the principals. The companies who then adopted the new material have ever since continued to have their new ships built of steel.

At an early date in the history of the introduction of mild steel for shipbuilding, it was discovered that about 80 per cent. of our native British ores were entirely useless for conversion into steel by any acid process. It was with the utmost satisfaction, therefore, that the basic process, invented by Messrs. Thomas & Gilchrist, was hailed by native steel manufacturers and users—shipbuilders among the rest. The possibility of producing steel by this process of a quality entirely reliable for purposes where only a low tensile strength was required, was proved as early as 1879; and in 1880, Messrs. Bolckow, Vaughan & Co., of Middlesbrough, were in a position to make 2,000 tons of basic steel per week from Cleveland ironstone. None of this product, however, was used for shipbuilding, and up to the year 1883, probably no basic steel had entered into the construction of ships or boilers built under the supervision of the Admiralty, Board of Trade, or Lloyd's Register. One of the earliest attempts to use it in shipbuilding was made in Germany in the year named, in vessels being built under the inspection of Lloyd's surveyors to class in their Register. The material was manufactured at Oberhausen, in Westphalia. Owing to repeated imperfections, which declared themselves as the material was about to be used in the vessels, a thorough investigation was instituted by Lloyd's Committee. A large quantity was carefully tested, with the result that it was found unreliable and unsuitable. The makers, after satisfying themselves of the justness of this decision, guaranteed that no steel made by the basic process would afterwards be supplied for these vessels, as they were unable with this material to fulfil the conditions laid down by Lloyd's Register Committee. In January, 1883, Messrs. Parker & Cornish, of Lloyd's, experimented on a quantity of angle bars rolled from blooms, supplied by the North Eastern Steel Co., for a ship building on the Tyne. The tests were, on the whole, satisfactory, and showed that basic steel could be produced of reliable quality. In December, 1885, however, extensive failures of basic plates, angles, and beams occurred simultaneously in several shipyards on the north-east coast of England. An inquiry into the whole matter was at once instituted by Lloyd's Committee, with the result that they declined to accept further supplies of basic steel until steel makers were in a position to show, beyond doubt, that they could produce by this process, a material possessing those uniformly ductile and reliable qualities, at the high tensile strength necessary for shipbuilding purposes.

In March, 1886, Mr. Percy Gilchrist, the surviving patentee, made application to the Admiralty—who up to this time had used no basic steel—for permission to have basic material admitted wherever Siemens' steel was specified. He, at the same time, offered facilities for thorough testing at the works of the principal manufacturers. Two of the most experienced steel surveyors attached to the Admiralty were appointed to this duty, and a large number of tensile, quenching, binding, forging, and welding experiments were carried out at the works of six different basic steel companies. A trial order for basic plates and angles to comply with the Admiralty tests for shipbuilding-steel, was also given to the Staffordshire Steel and Ingot Iron Co. The order was satisfactorily executed, the plates giving an average tensile strength of 28.5 tons per square in., and an elongation of 23.5 per cent. in 8 in.; and the angles 28.5 tons and 26 per cent. respectively. Mr. White, the Director of Naval Construction, at the meeting of the Institute of Naval Architects, in July, 1887, read a paper giving the results of these inquiries, and summed up by recording the opinion that "there is now no reason for doubting the possibility of producing, with proper care, basic steel suitable for ship work." At the same time, he emphasised the need for the continued exercise of care and skill on the part of the manufacturers.

In the spring of 1887, the Glasgow Iron Co. intimated to Lloyd's Committee their ability to make basic Bessemer steel equal in all respects to acid steel, made either in the converter or open hearth furnace. An extended series of tests of every description were accordingly commenced by two of Lloyd's

surveyors. Mr. Martell, Chief Surveyor to Lloyd's, in a paper "On the Present Position occupied by Basic Steel for Shipbuilding," also read at the July meeting of the Naval Architects already referred to, gives the results of these investigations, which were sufficiently favourable to allow of the acceptance of the steel for vessels intended for classification in the register book. Like Mr. White, he insisted on the necessity for the utmost care on the part of the steel makers, and intimated that Lloyd's surveyors would continue to use extra vigilance in the matter of basic steel, until confidence be fully restored.

The general tenor of these papers showed that basic steel had, in a great measure, regained the ground lost by the unfortunate failures of 1885. Since the papers were read nothing has happened to shake this renewal of confidence. On the contrary, basic steel has been steadily growing in public favour. The employment of open hearth furnaces, in the manufacture, is rapidly extending, and there is every reason to believe that further trials will prove open hearth basic steel to be equal, if not superior, to acid Siemens' metal.

The suggestion has been made, and to some extent acted upon, that as the basic process is capable of turning out a very cheap material of an extremely ductile quality with tensile strains, as low as 24 tons or lower, it might with advantage and economy be used in those features in ship structure chiefly subject to local strains, and removed from the severe tensile strains. This regard to the character of the strains, to which some portions of a vessel will be subject, and the employment of material of varying tensile strength to suit, has for some time obtained in some of the foremost shipyards. Thus, in the Transatlantic liner *America*, Messrs. J. & G. Thomson introduced steel of as high a tensile strength as 32 to 36 tons, for features *above* the lower deck, where longitudinal strength to meet the tension of the upper works was desirable, while the material employed *below* the lower deck or for features called upon to meet compressive strains was steel of from 27 to 31 tons tensile strength.

Exactitude and refinement in the selection of material, and the reduction of scantling are constantly being secured by careful and intelligent shipbuilders. It is contended by many, that the limits of tensile strength assigned by Lloyd's might even in ordinary cases be raised from 27—31 to 30—33, and the material still remain ductile, and otherwise fit for shipbuilding. This would enable a still further reduction to be made in the thickness of material, especially such as would not be under water and subject to corrosive influence, but even that could be easily counteracted by the modern system of galvanising.

This system of graduating the material to meet the varying needs of the several parts of a ship is one fraught with difficulty, but as experience extends, and manufacture improves, there is every probability of its being carried out to surprising issues. Speaking on this subject, Mr. William John, in his paper on "Iron and Steel Shipbuilding," read to the Iron and Steel Institute in 1885, remarked, "A question which appears to me will have to come up seriously in the immediate future, is whether, instead of fixing as at present, certain scantlings for certain ships in iron, and then allowing a fixed percentage for steel of a certain tensile strength, it will not become imperatively necessary, as a matter of common sense and justice, to have a graduated percentage of reduction from zero for iron, up to say, 10, 15, 20, and 25 per cent. for the varying qualities of steel in accordance with their varying strengths, so long as the material itself, in all the grades, is absolutely fit for shipbuilding purposes, in point of ductility, and every other quality. This I know will require very careful handling, and I doubt if it will be accepted immediately, but it seems to me to be what we have before us, and I am not so sure that, as we perfect our organisations, we shall not be able to do, what civil engineers and others feel themselves free to do, viz., to put in stronger descriptions of material in places where severe tensile strains are taken in ships, and to put in softer and thicker materials in places subject to local strains, and removed from the severer tensile strains."

Notwithstanding that it was at Landore the first successes were achieved in this country in the manufacture of Siemens' mild steel, and it was from thence that the first marked impulse was given to its development, it is to Scotland, and more particularly to the immediate valley of the Clyde, that we must look for its later progress. Development so rapid and pronounced followed upon its establishment there, English firms were perforce led into following, and striking confirmation of the fact was adduced, when comparatively recently, the

did-established and world-famed Consett Iron Co., of Durham, had to add the manufacture of steel plates to its business on account of the diminished demand for iron plates. Formerly the company produced about 7,000 tons of iron plates per month, but at the time steel making was entered upon, this had declined to little over 2,000 tons. Shortly after the steel works were in operation, the production of steel plates amounted to 8,000 tons per month. The Clyde valley being so pre-eminently the seat of the Siemens steel manufacture, it will be of interest to give a few general particulars of the history and extent of some of the more important works.

The Steel Co. of Scotland commenced operations in the year 1873, at Hallside Works, Newton, about five miles east of Glasgow, their works then comprising only four small Siemens' furnaces. The establishment of this now vast concern, according to the statements of the late Dr. Siemens, was the result of experiments made by the Tharsis Co., in 1867, with a view to the utilisation of the residue from its treatment of pyrites. The experiments were carried out at the works of Messrs. D. Rowan & Co., Glasgow, in a specially-constructed Siemens' furnace, and encouraged the belief that steel suitable for rolling into rails could be manufactured from the residue "blue billy," of which the Tharsis Co. possessed immense accumulations. These hopes, however, were never commercially realised; and from the first the steel at Hallside Works was made from hematite pig, scrap, and ore. The finished product was, for several years, principally rails; but, in 1876, the Directors of the company, having been impressed by the amount of success attending the manufacture of steel plates by the Landore Co.,—who, as already explained, began this branch of manufacture in 1875—laid down a 26 in. plate mill, and commenced the manufacture of steel plates for shipbuilding and boiler-making purposes. In March, 1876, Mr. James Riley, the manager of the Landore Works, read his memorable paper before the Institute of Naval Architects; and about a year later his services were secured by the Steel Co. of Scotland, as manager of their growing establishment. At this time steel was still regarded with suspicion by the great majority of shipbuilders and owners, and there can be no doubt that it has been largely due to the operations of this company, under Mr. Riley's intrepid management, and his personal advocacy of the suitability of steel, that such rapid and widespread development has attended steel shipbuilding. The demand for the newer material soon began to exceed the powers of supply; and in a few years other manufacturers entered the field. The Steel Co. of Scotland, to be better able to meet the needs of their customers, acquired the Blochairn Iron Works, situated on the north-east outskirts of Glasgow; and in 1880 converted them into steel works. Up to about August of the present year the company had turned out from their two works 365,000 tons of steel plates, and over 200,000 tons of steel bars and angles, rails and other products. The monthly output now ranges from 10,000 to 12,000 tons of finished steel, including castings and forgings of the largest dimensions, either in the rough, or turned and finished complete, and ready for use. There are now at the Hallside Works 18 large Siemens' melting furnaces, with a producing power of 110,000 tons of ingots yearly. The mechanical plant comprises three powerful steam hammers, with smaller ones for light forgings; a 28-in. cogging mill, a 26-in. mill for rails and heavy sections, two 26-in. plate mills, one 18-in. mill for light sections, and one 14-in. mill for bars, &c. An important branch of the company's business—and one constantly growing—is the manufacture of heavy marine castings. There is a large foundry, fitted with the best appliances for making steel castings up to 30 tons each. The company, indeed, has earned a high reputation for the production of intricate and heavy steel castings of the finest quality for all purposes. A large machine shop, with machines of great power, has recently been completed, and the company now undertake the supply of finished crank shafts, of cast or forged steel, as well as finished castings and forgings for other purposes, and of the largest size.

At Blochairn Works the company have 13 melting furnaces, with a producing power of 90,000 tons of ingots yearly; two 10-ton and one 7-ton hammers; one slab cogging-mill of large size, with hydraulic shears, for cutting 30-in. by 10-in. blooms; three large plate-mills; a universal mill for rolling bars or plates up to 30 in. wide, with rolled edges; also bars or blanks, with thickened ends, for making eye-bars or suspension-links; two sheet-mills; one bar-mill, and a guide-mill. There is also at these works a complete plant for flanging boiler plates by hydraulic machinery, and for machining the edges of plates.

The widest plate the company can roll is 10 ft. 3 in., and the heaviest bar sections, 14 in. by 3½ in. angles, 10 in. by 16 in. tees, 11 in. bulb-tees, 13 in. bulb-angles, and 10 in. Z bars. The combined annual output of the Hallside and Blochairn Works amounts to between 120,000 and 150,000 tons of finished steel, a quantity considerably in excess of that produced by any other open-hearth steel making firm in any country.

The second firm to begin the manufacture of Siemens' steel in Scotland was Messrs. Beardmore & Co., of Parkhead Forge, a very old-established works to the east of Glasgow. Starting the make of mild steel in 1879, they have now in constant work eight open-hearth furnaces of large size, and of the most approved construction. Their rolling mill plant is capable of producing the largest plates and heaviest bar sections required by shipbuilders and boilermakers, while the plant and appliances with which the works are equipped for making and finishing forgings of the largest size required by engineers, are of the most approved description. For the production of both hollow and solid forgings these works are famed. It was here the first triple-throw steel crank shaft was made, and the production of the heaviest and longest lengths of hollow shafting is a prominent branch of the business carried on by this firm. The monthly output of finished steel in the form of plates, bars, and forgings, ranges between 3,000 and 3,500 tons.

Messrs. David Colville & Sons, of Dalzell Steel and Iron Works, Motherwell, 10 miles from Glasgow, were the third firm to start the manufacture of Siemens' steel in Scotland. Their iron works were established in 1871, and in 1880 they began the manufacture of steel on ground adjacent. Such has been the success attending their business, they now rank second in importance among the steel manufacturers of Scotland. They confine themselves entirely to the manufacture of plates and bars, and the attention they have bestowed upon this important branch has resulted in the "Dalzell" brand of mild steel being invariably accepted as of a quality second to no other brand in the market. At the outstart, Messrs. Colville had four 12-ton melting furnaces, but the plant now comprises 16 melting furnaces, ranging from 15 to 25 tons capacity, two powerful steam hammers, two large plate mills, and one heavy bar mill, together with several smaller mills for lighter sections. The works have a productive power per month of from 7,000 to 8,000 tons of finished steel in the shape of plates and bars, and the total output for the present year is expected to exceed 90,000 tons.

As regards basic steel, there are two firms in Scotland engaged in its manufacture. Messrs. Merry and Cunningham, at Glengarnock, and Messrs. The Glasgow Iron Co., at Wishaw and Motherwell. In both cases, the steel is manufactured on the Thomas Gilchrist principle, and by the employment of the Bessemer converter. Early in 1887, as before stated, an exhaustive series of experiments was carried out at the works of the latter company by surveyors appointed by Lloyd's Registry, the result of which led to the acceptance of the company's basic steel, on the same footing as ordinary Siemens' steel. The company's works at Wishaw consist of three blast furnaces, three 7-ton converters, one large cogging mill, and a billet and heavy bar mill. Plates and light angle-bars are rolled at Motherwell, where the firm has an extensive plant. The company's output of basic steel amounts at the present time to about 3,500 tons per month, and is gradually increasing. The import to the Clyde, however, in large quantities, and at an extremely low price, of Spanish ores, is a deterrent influence on the basic steel industry.

## ELECTRICITY IN THE ENGINE-ROOM.

By FREDERICK WALKER.

THE introduction of electrical apparatus into the marine engineer's department is, in the case of most large steamship owners, rapidly becoming the rule rather than the exception, and although electricians are generally carried, their charge is merely nominal, the actual responsibility devolving upon the engineer.

Among practical scientists of every denomination the engineer is conspicuously progressive, and readily becomes practically and theoretically familiar with appliances of a nature hitherto strange to him, but, by the ever-increasing demand for improvement, now daily under his notice, and placed under his charge. It has been asserted, and truly, that there are

two distinct types of engineers in these days: the college man, who is a profound mathematician; and the man who has had the advantage of a severe practical training in the workshops, and yet is able to perform any mathematical work that may be necessary in the routine of business. The former, in the case of a breakdown, will, with mathematical precision, elaborately define the cause thereof, but the latter will smartly remedy the effect in a practical and workmanlike manner, and afterwards investigate the prime cause in a logical style, with a result equally efficient, although the algebraical symbols may be less profound and complex.

However, the marine engineer who is perfectly conversant with the foot-pound as a unit of mechanical work, pounds per square inch, and inches of mercury for the measurement of + and — pressures, and who is no stranger to the computation of tangential strains, or ratios of expansion, may yet find that the practical units of electrical measurement do not convey a definite impression, as the more familiar foot-pound, knot-hour, or gallon. He has, in connection with his electric light installation, a volt-meter, and an ampère meter, or ammeter, and he knows that the resistance of the incandescence lamps in the saloon are estimated at a certain number of ohms, hot or cold, yet the measurement of an intangible, invisible force, that neither occupies an apparent space nor creates a sensible pressure, in terms of pressure or "potential" "quantity," and "resistance," appears to be indefinite and vague.

The fundamental units are generally known as C. G. S., or *centimetre-gramme-second* units, and are based upon these metrical or decimal measurements of length, mass, and time, because in all probability this system will obtain in every civilised country in the future, and form, as it were, an international code among scientists of all nations.

Having, therefore, the centimetre as a unit of length (L), the gramme as a unit of mass (M), and the second as a unit of time (T), we may consider the secondary, or derived units, namely, velocity (V), which is unit length traversed in the unit of time, or  $V = \frac{L}{T}$ ; force (F), expressed as  $F = \frac{L M}{T^2}$ ; and energy or work (E and W) the energy due to, and work done by the application of force,  $\frac{L M^2}{T^2}$ . The derived units are the

"centimetre second, and the unit of velocity V, the "dyne" as the unit of force F, and the "erg" as the unit of energy or work E or W. To give an illustration of the general impracticability of the C. G. S. system of units for the purpose of ordinary electrical measurements, we may compare the relative values of the "erg" and the better known foot-pound. One foot-pound is equivalent to 13,564,325 ergs, consequently the estimation of 1 H.P. in ergs reaches the astounding number,

$$1 \text{ H.P.} = 447622725000 \text{ ergs.}$$

Hence the employment of the practical units, the volt, ampère, ohm, and watt.

In order to render the C. G. S. system sufficiently comprehensive as to be applicable to every phase of electrical energy, it is further subdivided into two sections, comprising electro-static units, and electro-magnetic units. Every amateur who has experimented in "static" or "frictional" electricity, knows that a ball of pith, or other light substance, freely suspended, and "charged" by contact with rubbed sealing-wax, will repel a similar "charged" ball with a certain force, and will also attract the second ball with an equal force, if the said balls be oppositely charged. Such, also, will be the behaviour of suspended magnets—like poles repelling, and unlike poles attracting. The electro-static unit in the C. G. S. system, therefore, is derived from a charge of electricity that will repel an equal charge of like sign at a distance of one centimetre, with a force of one dyne, or similarly attract an equal charge of unlike sign. The corresponding electro-magnetic unit is a magnetic pole that will repel a similar pole or attract it, if of unlike sign, at a distance of one centimetre apart, with a force of one dyne. This force, acting during one second, produces a velocity of one centimetre per second.

An electric current, traversing a conductor, produces in its neighbourhood a magnetic field, varying in intensity inversely as the distance, and directly as the current. Therefore, two suspended conductors, through each of which a current is passing, will repel each other if the direction of the current be the same in each, or attract if each be oppositely traversed. The unit current, under these circumstances, will repel or attract an equal current at a distance of one centimetre apart, and for each centimetre of length, with a force of one dyne; and also

the unit current traversing the conductor, which is bent so as to form an arc of a circle, one centimetre radius and one centimetre in length, will repel a unit magnetic pole placed upon the centre, with a force of one dyne.

Having thus briefly introduced the fundamental units, and the relative values thereof in plain terms, we may, before tabulating the equivalent units, describe a method generally employed when dealing with C. G. S. units, for the purpose of curtailing the figures, which would, if written in full, be exceedingly inconvenient in practice. For example, to write 10,000 in figures not only occupies more space, but also adds to the complication of the integral values, than to denote the same number thus,

$$10^5$$

employing an index, similar to that used in logarithms, really signifying the "power" to which the number is raised, as in the above example, or, when the index is used negatively, the index indicates the number of tens by which the prime number is to be divided, the actual result being a decimal fraction, thus,  $10^{-2} = 0.01$  and  $10^{-4} = 0.0001$ .

The following table will show the relative value of the practical units, with the representative symbols, in terms of the C. G. S. units:—

Terms.	Symbols.	Name.	Value in C. G. S. Units.	Dimensions.
Electromotive-force.	E	Volt	$10^8$	$M \frac{1}{2} L^{\frac{1}{2}} T^{-1}$
Current strength.	C	Ampère	$10^{-1}$	$M^{\frac{1}{2}} L^{\frac{1}{2}} T^{-1}$
Resistance.	R	Ohm	$10^9$	$L T^{-1}$

The first of these practical units is the Volt, symbolised in formulae by E, and is the unit of "electromotive force," "potential tension," or, in plainer words, electrical pressure, and to employ a familiar analogy, although somewhat restricted, the function of this unit in the calculation of electrical energy or work, may be likened to that of P when this symbolises pressure per square inch of the piston in horse-power formulae. A definite pressure per square inch of area is clearly understood by all practical engineers, and the value of this pressure as a factor in the estimation of power, but still pursuing the analogy above referred to, let us imagine a diaphragm, or rigid and fluid tight piston fixed within a cylinder, one end of which is open to atmospheric pressure, and the other open to a steam pressure of 115 lb. to the square inch. Now, taking the approximate value of the atmospheric pressure at 15 lb. per square inch, we may allow the strain or stress upon the rigid piston, tending to displace it, at 100 lb. per square inch. Here we see that the unit of potential or tension is based upon one pound pressure upon one square inch of surface. Then, supposing that a hole, one inch in diameter, be drilled through the diaphragm or piston, a flow of steam will take place from the side of maximum pressure to that of minimum pressure. If we wish to increase the flow, or quantity of steam passing per second, we must either enlarge the hole, or increase the pressure. In the case of an electrical circuit, where a potential or electromotive force of a given number of volts exists between two points in said circuit, and a current is required to traverse a conductor giving said points, the flow or current strength per second is proportional to the potential or electromotive force, and the resistance of the conductor. In order to increase the current, we must either increase the electromotive force or initial pressure, or decrease the resistance, as in the case of the analogous piston or diaphragm.

The volt, as a practical unit, is of the value of  $10^8$  C. G. S. units, and nearly approximates to the electromotive force of a Daniell cell, when the liquid electrolyte surrounding the zinc element is a solution of sulphate of zinc, and the temperature is about 60° Fah. A volt-meter, whether of the type generally known as electro-magnetic, or like Capt. Cardew's, where a fine wire of high resistance actuates an index by the linear expansion due to the increased temperature caused by the passing current, is usually placed as a "shunt" in the electrical circuit between the points where the potential is to be measured. In both cases the high resistance of the instruments admits of an infinitesimal current passing between the points in the circuit, relatively to the total resistance of an ordinary installation, hence any deflection, or move-

ment, must be due, and directly proportionate to, the electrical pressure or potential. To still carry out our analogy; the cock and cylinder of an indicator is infinitely small compared with the ports and vast capacity of a large steam cylinder, and, since the area of the piston of the indicator is small, relatively to the load, or resistance of the spring, it is evident that any vertical movement of the pencil must be due to pressure, and not to quantity.

The AMPERE is the practical unit of current flowing per second of time, the value of which, in C. G. S. units, is  $10^{-1}$ , and is perhaps more generally appreciated and understood as a concrete value than the volt or ohm. This, perhaps, is due to the fact, that in the decomposition of water, by causing a current of electricity to pass through it, a known quantity, or volume of hydrogen and oxygen is liberated per second per unit of current, and the collection of the gas by the displacement of water in an ordinary gas-holder, over a pneumatic trough specially adapted to the purpose, allows of the accurate estimation of the current of electricity in terms of the volume of liberated gas. One ampère per second liberates 0.000105 gramme of hydrogen. An electro-magnet, however, with a given number of turns of wire, will vary in magnetic intensity directly as the current traversing the wire, and the magnetic pull, or work done, will increase with the current until the limit of saturation of the iron core be reached. Some forms of ammeter are based upon this principle, and others upon various other well-known properties of an electric current; but in all cases the electrical resistance of the instrument is low, and the sectional area of the conductor within it sufficiently large, so as to permit of the whole current traversing it, in an ordinary marine installation, without interposing an appreciable idle resistance, or heating the coils or other parts of the instrument.

The OHM is the practical unit of resistance, and is equal to  $10^9$  C. G. S. units, this being its theoretical value. The ohm, as a standard unit, is represented by a column of mercury, of one square millimetre in section, and one metre in length, at  $32^\circ$  Fah., but may practically be approximated by a wire of pure copper, No. 22 B. W. G., and 100 ft. in length. The ohm really forms the datum for all calculations relating to electrical power, and if its value be altered, the ratio of each factor is relatively different, and, since the consideration of electrical resistance is purely theoretical, and is merely an expression for, or signification of, the reciprocal of conductivity, it is of real importance that a perfect standard should be adopted, based upon the C. G. S. values.

Ohm's law establishes the relation between the three practical units of electrical measurement, and, knowing the value of two of these, the third unknown value may be easily determined, thus symbolising electromotive force, or potential, in volts by E, current in amperes by C, and resistance in ohms by R, we have

$$\begin{aligned} \frac{E}{R} &= C \\ \frac{E}{C} &= R \\ C \times R &= E. \end{aligned}$$

The WATT is a unit proposed by Sir William Siemens to the British Association in 1882, and has now become generally known and adopted. It is the rate of doing electrical work with a current of one ampère at an electromotive force, pressure, or potential of one volt, and is represented thus:  $E \times C \times W$ . The watt is equal to 0.737 foot-pound per second, or 44.22 foot-pounds per minute, which is the value best understood by engineers generally. Hence the watt represents

$\frac{44.22}{33,000} = \text{I.H.P.}$ , or  $\frac{1}{746} \text{ H.P.}$  The formula usually employed in the estimation of the output of a dynamo electric generator is  $\frac{E \times C}{746} = \text{H.P.}$ , and therefore if we have a machine of this

description, the output of which is marked or stated as 100 volts and 251 amperes, we may ascertain the value of said output thus:

$$\frac{100 \times 251}{746} = 33.7 \text{ H.P.}$$

and if the efficiency of the machine be accurately stated as

90 per cent., the mechanical power absorbed in developing the output as shown above will be—

$$\frac{90 \times 33.7}{100} = 30.33$$

$$\text{and } 33.7 - 30.33 = 3.43 \text{ H.P.}$$

Therefore,  $33.7 + 3.43 = 37.13 \text{ H.P.}$ , the actual power that would have to be provided, so that the prime motor, such as a steam-engine or the like, may drive the dynamo when it is electrically working with a full load.

In the nomenclature of the electrical world, 1,000 watts is frequently termed a "unit" when applied to the output of a dynamo-generator, and the term "kilowatt" is also synonymous. Hence a machine having an output of 100 volts and 40 amperes would be styled a 4 unit, or a 4 kilowatt machine.

The fundamental units being either too large or too small for ordinary practical purposes, it has been found to be expedient to make use of multiples or sub-multiples as prefixes to the names of the units, such as Meg, a multiple prefix signifying 1,000,000, as megohm, = 1,000,000 ohms; myria, 10,000; kilo, 1,000; hecto, 100; deca, 10; and the sub-multiple prefixes indicate fractions of a unit, such as deci, =  $\frac{1}{10}$

centi, =  $\frac{1}{100}$ ; milli, =  $\frac{1}{1000}$ ; and micro, =  $\frac{1}{1,000,000}$ . Thus

the electrical resistance of the insulation of a circuit may be defined in megohms, and the infinitesimal current developed by a pin and a needle immersed in sea water, and acting as a tiny primary battery, may be estimated in milliamperes, or the energy, or work done by such a combination, in microwatts.

The progress of science, and the recent improvements in marine engines, have directed the attention of engineers to the triple and quadruple expansion engines now in general use; and although in former times, when these marvellous products of the ingenuity and skill of man were not in existence, the engines of that day were known thoroughly, and the power and duty fully estimated by diagrams, no stretch of imagination could show a possibility of accuracy in taking a readable diagram from the complex machine in the hands of marine engineers of our day. The men, however, have quietly risen to the need, and such is the effect of the thoroughly practical and scientific training necessary to fit them for their duties, that no matter what innovation be made in the way of the introduction of new appliances requiring the study and practical application of other branches of science, the engineer is ever ready, and without ostentation, will take capable charge and responsibility.

(To be continued.)

## LLOYD'S FEES.

AT the annual meeting of the Sunderland Shipowners' Society, Mr. J. Short, in seconding a vote of thanks to Mr. Jas. Laing and Mr. R. M. Hudson for their services in representing Sunderland on Lloyd's Committee for the Registration of British Shipping, said he would like to take that opportunity of bringing before the members of the Society three important questions, which, he thought, were well worthy the consideration, not only of the shipowners of the port, but of the shipowners throughout the United Kingdom—1st, the necessity of an increased number of practical representatives for the outports to be placed on Lloyd's Committee; 2nd, Lloyd's charges for the classification of new vessels; 3rd, the Board of Trade method of measuring for tonnage erections on the tonnage deck. To obtain the first of these questions, let him urge upon the members of that society the advisability of joining with similar societies, not only on the North-East Coast, but in Scotland, in demanding an increased number of practical representatives for the outports to be placed on Lloyd's Committee. The number of representatives for the outports was out of all proportion to the tonnage or capital held in comparison to the City of London. They found that London was represented on the Committee by 26 members, Liverpool by 10 members, and the outports—that was, the whole of the United Kingdom, excepting London and Liverpool—were represented by only 16 members. He thought the shipowners generally would agree that that was not a fair proportion, and ought to be increased,

and increased by gentlemen who had a thorough practical knowledge of the best method of construction in all matters relating to the Mercantile Marine of this country. They could congratulate themselves upon being so fortunate as to have two such practical and experienced representatives for the shipowners of that port—Mr. Laing and Mr. Hudson. But the necessity of strengthening the hands of these gentlemen by an increased number of practical representatives for the outports was self-evident by the new duties which Lloyd's had now assumed; for not only did they undertake to see that their vessels were constructed according to rules which they had laid down, but they now undertook to say how much they should carry in their vessels by fixing a load-line. This huge monopoly had grown, and would continue to grow, unless they had an increased number of practical representatives for the outports on the Committee, into a society of officials who looked upon their duties as one of serving the shipowners with one hand, and the underwriters with the other. They believed they benefited the shipowner by continually demanding an increased quantity from the shipbuilder. This might be a fallacy, and even detrimental to the interests of the shipowner, if such increased quantity was not properly applied. To benefit the underwriter, Lloyd's now demanded a decreased carrying capacity from the shipowner by fixing a high freeboard. He would leave that question with them to say if the method of fixing a freeboard was satisfactory, or to the advantage or disadvantage of the shipowners of the country. It behoved every shipowner and others interested in the prosperity of the Mercantile Marine of this country to be careful and watchful over the doings of that close corporation, which, under the direction and management of a selected few, might become despotic and even dangerous to the shipping interests of the country, and he believed their only safeguard was to have an enlarged membership of practical gentlemen on the Committee. His second question—Lloyd's charges for the classification of new vessels, which he wished to bring before them, and especially before their representatives on Lloyd's Committee, was the increasing of the already enormous charges for classification of new vessels. It might be thought by some members of that society that that was entirely a shipbuilder's question, but they must not shut their eyes to the fact that it was an indirect charge upon the shipowner, and therefore a proper question to be taken up and dealt with by that Society. It might be interesting to them to know the charges to the shipbuilders upon new vessels. On the hulls Lloyd's charged 1s. per ton up to 1,000 tons, and 6d. per ton for every ton over 1,000 tons, and an entry fee of £4 and £5 per ship. From a calculation made on the vessels launched at that port during the year 1888—75 vessels, representing a tonnage of 142,000 tons—he found their fees from the shipbuilders on the hulls only, would amount to the large sum of £5,597 15s., and their charge to the engineers for classification of machinery was 3s. per registered H.P. up to 200, and 1s. per H.P. for every H.P. above 200, with an entry fee of £2 per vessel. Owners were at liberty to register their engines any H.P. they liked, so long as they paid the additional fee. They could frequently find in Lloyd's books engines of precisely the same size and power, one registered twice the power of the other. He only mentioned this to show what Lloyd's would do for fees. Their charges on machinery supplied to vessels built at that port during last year would amount to the sum of £2,139. In addition to these heavy charges made upon the shipbuilders and engineers, they now found they made a charge on the manufacturers of the materials used in the construction of their vessels. Lloyd's charged at least 6d. a ton on all steel supplied to the shipbuilder, which, upon the 60,000 tons consumed in the construction of the vessels built at that port last year, would amount to at least £1,500. They also charged 1s. per ton on all steel boiler plates supplied to the engineers, which would amount to fully £250 on the 5,000 tons used by the engineers last year. Even this was not all. They charged a fee of £2 2s. to the maker on every donkey boiler supplied to the vessels, which amounted to a further sum of £157 10s., and then again there was their charge to the manufacturers for travelling and others expenses for the inspection of ship-forgings, and they all knew that Lloyd's had secured the monopoly in the testing of anchors and cables, and the profit they made out of that was well known to themselves. When and where that sort of thing would stop was a question which their representatives might deal with in the future. He did not object—in fact, he believed they could much supervision in the construction of their

vessels or in the manufacture of the materials used—but he did object to Lloyd's increasing their enormous charges for such supervision. In round figures, last year Lloyd's fees on the new and old work turned out at the port would amount to no less a sum than £11,000, and he ventured to say that their expenditure for the supervision of such work did not exceed £4,000. It might be said that last year was an exceptionally brisk one in the shipbuilding trade, but he ventured to say that, during the last fifteen years, their average income had been twice the amount of their expenditure at that port. It might be said that Sunderland was a great shipbuilding centre, and that it must make up for a deficiency in the revenue of other ports not so favourably situated. But he submitted that Lloyd's received in fees on the construction of new and charges upon old vessels in the United Kingdom twice the amount they expended for supervision during last year. They might again be told that last year was an exceptionally busy one throughout the shipbuilding trade, but he again said their annual income in the United Kingdom had always been in excess of their annual expenditure. He believed large sums of money were expended over surveyors abroad, who were principally the agents of the underwriters. But that the British shipowner should be indirectly taxed to such a large extent for the benefit of the underwriters was manifestly unfair. He believed Lloyd's Committee, as constituted, represented one-third underwriters and two-thirds shipowners. He hoped they all believed in the principle that representation should follow taxation, but he failed to find where the underwriters contributed, directly or indirectly, one single farthing to the support of Lloyd's Registry of Shipping. But, independently of this large expenditure over agents abroad, who were principally the agents of the underwriters, he had no hesitation in saying Lloyd's accumulated profits were not far short of a quarter of a million sterling, which brought them in an income of about £8,000 per annum, and that they were adding to that enormous fund £20,000 to £30,000 per annum out of the pockets of the British shipowner. Lloyd's could well afford to make a reduction of 20 per cent. in the charges for classification of new vessels and still carry a large profit to their grand reserve fund. The third question which he wished to bring before the meeting, the Board of Trade's unfair method of measuring for tonnage erections on the tonnage deck was different from the previous question in this respect: It was one affecting themselves directly. He thought the members of the society would agree with him in saying that the main object of the shipowners in making an erection on the tonnage deck was to add to the safety of the ship and to the comfort and convenience of the crew. Turning to the Merchant Shipping Act of 1876, they found that it said:—"All permanent closed-in spaces on the upper deck available for cargo or stores or for the berthing and accommodation of the crew, shall be measured and added to the tonnage under tonnage deck; but nothing shall be added for a closed-in space solely appropriated to the berthing of the crew, and nothing shall be added in respect to any building erected for the shelter of passengers." But the spirit of that Act, to his mind, never contemplated that, when a shipowner added an erection such as hatchways, or chart or companion house, the same should be added to the tonnage. By the present method of measurement, an inducement was held out by the Board of Trade to the shipowner to discontinue those safeguards to the ship and comforts of the crew. To his mind it was absurd, and well worthy of the consideration of the shipowners of the country, as it could be clearly shown that the present method of measuring erections for tonnage by the Board of Trade was unfair, and held out an inducement to build vessels without erections, which could not by any means be considered as safe as those with erections. He thought if that question was brought before the Board of Trade some concessions would be made by them, as, under the Merchant Shipping Act of 1876, they had power to make modifications and alterations in the tonnage rules, in order to the more accurate and uniform application thereof. He trusted that society would look into those questions, and at the next annual meeting would be able to say they had removed, if not the whole, at least some part of those defects in the method of measuring for tonnage erections on the tonnage decks of their vessels.

The motion was agreed to.

## BRISTOL CHANNEL PORTS.

## II.—SWANSEA.

"SWANSEA, you may depend upon it," Sir Hussey Vivian is reported to have once said, "is destined to become the future Ocean Port of England," and in this expression is contained the highest hopes and aims of the Swansea people. For years they have been striving to secure a deep-water entrance, and for years the late general superintendent was perpetually dinning into the ears of everybody who would listen, the great advantages possessed by Swansea. One day he was lecturing on Swansea to his fellow-members of the Balloon Society; a few days later he sought to enlighten Birmingham people on ship canals, and did not forget to point out that the best possible scheme they could support would be one for improving the waterway between their town and the Bristol Channel, because they could so easily send their goods to Swansea for shipment. Some men laughed at Mr. Capper for thus puffing his own particular port, but if we are not much mistaken, they are gradually coming to find Swansea less talked of. Under a new régime the system pursued appears to be one based on a firm belief in the survival of the fittest, and for aught we know to the contrary, it may eventually be found to answer well, for Swansea is decidedly fit for a brilliant future, and possesses advantages which must tell. Apart altogether from any Transatlantic trade, Swansea already possesses unequalled advantages over other South Wales ports. She is fully a tide nearer the open sea for one thing, ships leaving her docks have no crowded channel to thread, and there is now ample depth of water for as big ships as any which frequent the Bristol Channel. The writer of the present articles remembers within the past five years a steamer of 2,200 tons cargo having to leave Swansea some 200 tons short of cargo on account of there being lack of water in the East Dock.

Now, however, the magnificent steamers of the Atlantic Transport Line (Messrs. Williams, Tarrey & Feild, Limited), have fortnightly sailings from the port, and some of their vessels go away with over 4,000 tons of cargo. It is to this line, by the way, that Swansea looks for the inauguration of her direct American service. At present the steamers only call at Swansea on their outward passage to fill up their cargo space with tin plates, returning from the American ports with cargo for London. We are informed that a new move will shortly be made, and that the steamers, or some of them, will return direct to the Bristol Channel (Bristol and Swansea) with produce. Most heartily do we wish the venture success. In addition to this line some of the Dominion liners have regular sailings during the winter from Swansea, as do the "City" boats (throughout the year) of Messrs. Charles Hill & Son. By the way, it is worthy of note that notwithstanding the brag and bluster of some Swansea owners, those who are conspicuous at dinners and such places where reporters are present, the inception of the direct service between this Welsh port and the States was due to a North Country firm, Messrs. Middleton & Co., of West Hartlepool, who started the "Shamrock" line some time about 1842. They were ably assisted by Messrs. Burgess & Co., their Swansea agents, a firm whose members do more work than public speaking, and who, when Messrs. Middleton took their steamers off that business, took very good care that the line should not come to an end. It was due to this firm, we believe, that the Atlantic Transport and Hill's lines took up the business. In fact we are saying no more than the truth when we add that Burgess & Co. are ever on the alert to run a line from Swansea to somewhere or another, and they now have regular sailings to the States, the Mediterranean ports, and Batoum. This port of Batoum is a new destination for Swansea-laden ships, and, of course, it is all due to the wonderful oil wells of Baku. There is a demand there for tin plates, and all these are sent from Swansea. To show how this particular trade has grown, we need only say that in 1886 the tin plates sent thence from Swansea were nil. Last year the total shipments amounted to 17,323 tons. It is, of course, the fact of her being the seat of the tinplate trade which has caused Swansea to occupy the position she now does in respect to the American trade. The export of this commodity to the States last year equalled 120,047 tons, rather less than the previous year, because the Liverpool liners being so much in want of heavy cargo as ballasting, quoted rates which enabled them to take traffic from the Swansea liners. Of course, this is easily accounted for by the fact that the Liverpool boats have a profitable passenger trade which enables them to cut rates on goods; the Swansea

liners, on the other hand, do not profess to carry passengers, and hunt more for profit than glory; in these two things they differ from some Liverpool lines. This is a fact which will be readily understood by the shareholders in the latter undertaking.

As a coal port Swansea may hardly be said to shine; her exports are less than either Cardiff or Newport, as is well known, but yet the trade is increasing, although to no great extent so far. Thus for 1887 her exports of coals and coke amounted to 1,331,838 tons, and last year to 1,334,019 tons, but in 1878 they amounted to only 843,590. She occupies the first position, however, in patent fuel shipments. In 1887 her shipments of this were 240,439 tons, in 1888, 267,221, and in 1878, 110,960 tons. These figures are cheering, and Swansea men can hug to their bosoms the pleasure of beating Cardiff in patent fuel if they cannot do so in coal shipments. It may not be generally known, by the way, that the largest patent fuel works in the world, those of the Graigola Merthyr Co., Limited (Cory, Yeo & Co.), are located at Swansea, and in addition to them are the works of Messrs. Vivian & Co., and the Atlantic Patent Fuel Co., Limited.

But if Swansea occupies a secondary position now in coal shipments she does not intend to have such a state of affairs continue. There is being constructed a new railway connecting the Swansea Bay ports with the Rhondda Valley, and when that is completed it will be possible to ship the far-famed Rhondda coal more cheaply at Swansea than at Cardiff. That, in conjunction with her excellent geographical position, should do wonders for Swansea. At any rate, there will be the means of doing a big trade in coals; it will depend upon the Swansea coal shippers whether the advantage be made the most of or not.

The works in the immediate neighbourhood of Swansea are numerous and varied. In addition to the scores of tinplate works, with the output of which we have already dealt, there are gold, silver, and copper works, steel works, blast furnaces, manure works; in fact everything, however remotely connected with metals or the metal trades, gives cause for the erection of a works. Amongst the various manufacturers of the district Messrs. Vivian & Sons stand pre-eminent. They have, in the first place, copper works, in connection with which are electrolysis works, where gold and silver are extracted from the copper ores by means of the most improved electrical systems. We cannot say much about what is actually carried on in this department. Of course, the members of the firm know, as does the general manager (Mr. J. T. Nettell), and the electrician (Mr. Alex. S. Taylor), but nobody else does; and as to what the next move will be no one at all knows, for Mr. Taylor is always thinking out some new use for electricity in connection with metals, and we believe has hit upon several new "trade secrets." It is due to this sort of thing that "Vivians" are so famed, for Sir Hussey Vivian, the head of the firm, appears to encourage new departures. Then the same firm own extensive chemical works, spelter works—but we really cannot say what they do not own in connection with the particular trades of the district, except tinplate works, and we understand that there is some scheme on foot for the erection by the firm of this class of works also. Next in importance to Vivian's works are the Morfa works, now owned by a limited company, and the Port Tennant Works of Messrs. Lambert & Co. At Landore, a suburb of Swansea, more noted for dirt than beauty, are the famed (in more ways than one) Landore Siemens Steel Works, and the furnaces of the Swansea Hematite Iron Co. Further off are the spelter works of the English Crown Spelter Co., the works of the Cape Copper Co., Limited; the Elba Steel Works of Messrs. Wright, Butler & Co., Limited; whilst, of course, in all directions there are collieries and the everlasting tinplate works.

These numerous works naturally cause a demand for raw material, and we find amongst the imports (a) copper, silver, lead, tin, and nickel with their ores and alloys; (b) zinc, with its ores and alloys; (c) iron ore; (d) iron, spiegeleisen, steel, pig-iron, &c.; (e) pitwood and timber; (f) sulphur ore, pyrites, &c. The quantities and values of the above for the past year were as follows:—

Tons.	Value (Estimated).
(a) 158,373.	£1,977,966.
(b) 33,861.	£179,245.
(c) 101,193.	£101,668.
(d) 104,423.	£299,696.
(e) 55,855.	£101,194.
(f) 46,197.	£139,585.

The numerous works also cause a considerable export trade, distinct from the coal and patent fuel exports, with which we have already dealt. The exports of copper, zinc, &c., amounted last year to 16,409 tons, with a value of £739,678; tin, tinned and blackplates, 201,896 tons, value £2,826,544; alkali, superphosphate, arsenic, &c., 35,285 tons, value £319,770. These few figures will show that although the tonnage of imports and exports may not be high, the values, thanks to the nature of Swansea's special trades, are considerable, amounting, as they did last year, to £10,181,307.

With regard to the port, considered as a port pure and simple, it cannot compete in dock area with either Cardiff or Newport, but with the opening of the Rhondda and Swansea Bay Railway, no doubt a demand will arise for further dock extension. The present docks are three: the North, the seat of the copper ore wharves and fuel works; the South and the East, or Prince of Wales Dock, the most commodious dock of the three, and where all the tinplate steamers take in their cargoes. With regard to facilities for shipping, they are considerable, but a demand which has existed for some time for increased coal tipping arrangements is only now being met. This is, we believe, the first distinct improvement which has been effected by the new general superintendent of the Harbour Trust, Mr. John Dixon, and to show the importance of it, we need only mention that lack of coal tipping and siding accommodation was driving away trade. It will not be the new superintendent's fault if this lost trade be not recovered. The ship-repairing facilities are excellent. In the foremost rank are the dry docks and shops of the Swansea Dry Docks & Engineering Co., Limited, who own two of the largest and deepest docks in the port, and the only docks which open direct from the floating harbours. Close upon their heels come the works of the Central Graving Docks & Engineering Co., Limited, whose dock is 350 ft. long, as compared with the 480ft. and 400ft. lengths of the older company, and who, like the first-named company, possess a depth of water of 13 to 22 ft. Then there are sundry smaller dry docks opening from the river. As a matter of fact, Swansea ship repairers declare that there are too many dry docks, but this, we take it, is so much the better for the shipowners. However, with this part of the subject we may deal at a later date.

The traffic facilities both around the docks and for bringing goods from a distance for shipment, are excellent. The former are in the hands of Westlake's Low Level Haulage Co., and of Messrs. Powlesland & Mason. The Docks are surrounded by over twenty miles of railway (the property of the trustees), connecting them with the three great railway systems, viz., Great Western, the Midland, and the London & North-Western.

The report of the past year's trade shows 1888 to have exceeded in importance any previous year, and there is every reason to believe that this increase will be maintained. The staple trades of the district are improving; new works are being erected, more are spoken of; the new line will bring the highest qualities of Welsh coal to the port. All round, in fact, there are evidences that Swansea's trade should go on increasing rapidly, and new trades once secured will cling to the place on account of the great natural advantages it possesses.

### THE ATLANTIC SEASON.

A Times Glasgow correspondent writes:—The Atlantic season is starting very much earlier this year than for some time, and there is every prospect of an active trade so far as tourists are concerned. The number of Americans who will cross to this country, and hence to the Paris Exhibition, is expected to be very great, and already the bookings from New York are very heavy. In one other respect, too, the season will be noteworthy, for not for years has such a large number of new vessels entered the lists to compete for supremacy in public favour, as well as in speed. The Inman and International Co. last year placed on the route their new steamer the *City of New York*, but her sailings were then practically experimental, and she is now just beginning her hard work. A sister ship, named the *City of Paris*, is being completed at Messrs. Thomson's establishment on the Clyde, and will start on her first trip on April 3rd. The White Star Line will add to their fleet, two or three months later, two vessels—the *Trenton* and *Majestic*. The Red Star Line are having a new liner built by Messrs. Thomson; a new liner was launched last month from Messrs.

Laird's yard on the Mersey, and another is building on the Continent. Several of the Continental lines are adding to their fleets, so that from ten to a dozen new steamers will be put on the Atlantic service this year. One of the most remarkable of these vessels, if, indeed, it is not the most noteworthy, is the *City of New York*, in view of the amount of complicated machinery she has on board, and of the novel conditions under which she is being tried. Since she ceased her sailings in November exaggerated reports have been circulated as to radical changes made in the machinery. This is but an indication, however, of the great interest taken in the vessel, and it is, therefore, of importance that authoritative information should be given on the subject. The great novelty in the ship is the fact that the boilers are worked under forced draught, and this necessitates many other innovations. Although boilers have previously been worked on this principle for short periods, this is the first occasion on which it has been tried continuously for several days, and the performances of the vessel have, therefore, been watched with interest. The fact that in the last of the four round voyages she made she beat the *Etruria* out and home amid very stormy weather, established the fact that her speed and seaworthiness under such conditions were excellent, and that the steam-producing powers of the ship were sufficient for the greatest requirements. The builders have not needed to make any great changes as has been stated. The engines have had the complete overhaul usually given to fast Atlantic steamships when laid up for the winter. Small adjustments which experience has shown to be desirable have been made. Those who have had experience in high-speed vessels know how difficult it is to fix upon the best propeller at the first attempt, and the *City of New York* is no exception. Her stormy weather speed showed that the steel twin-screw propellers could drive her well; but to secure equally satisfactory results in fine weather they have been replaced by new manganese bronze propellers made of Parson's metal, and practically of the same diameter and pitch. This will result in the surface friction of the blades being reduced, and will add to the number of revolutions. This, again, will necessitate more steam, which the boilers are considered well able to supply. Many changes have been made to secure the greater comfort and convenience of passengers. These changes indicate the desire of the Inman and International Co. to make their vessels comfortable as well as speedy passenger steamers.

### NATIONAL ASSOCIATION OF SHIP AND MARINE ENGINEERS' DRAUGHTSMEN.

THE tendency of the age, in almost every trade, seems to be towards co-operation, both as regards employers and employed. In almost every department of industry there are, in some form or other, "trades' unions." These have now come to be looked upon as almost necessary, in order that the rights—real or imaginary—of the working man may be established. Masters against men, men against masters, is too often the order of things, especially on the question of wages. The weaker—in point of necessity—has to give way to the stronger. Might is too often established as right, or a strike—one of the most terrible of modern trade evils—takes place. The problem of wages seems insoluble. The relations between masters and men are strained generally, instead of sympathy existing between them. Where the remedy lies, and whether the fault is partly owing to the existence of "unions," few can hope to definitely determine.

The latest endeavour at co-operation has emanated from the Tyne district. With Newcastle as headquarters, the National Association of Ship and Marine Engineering Draughtsmen has sprung into being. It is hoped to form branches in all the shipbuilding districts in the country. It must not be understood, however, from what has been said, that this Association is formed on the lines of ordinary trades unions, although to a certain extent it may evidently partake of that nature, by endeavouring—though perhaps not directly—among other things, at raising the present low standard draughtsman's wage, and regulating the working of overtime. It also aims at raising the draughtsman himself to his proper position in the works, for it has to be admitted that his services are, to say the least of it, too often minimized. Furthermore, it is hoped to establish a means of intercourse, and opportunities for the discussion and advancement of problems and scientific ques-

tions relating to the profession. Dreams are also entertained of having, in the future, a Library of naval architecture and marine engineering, and later on, an experimental tank in connection with the Association.

A secondary, or inner scheme, is the formation of a benefit society, open to members of the Association only.

It is intended that this Association, far from being detrimental to the interests of employers, should actually be to their advantage, by supplying them with a better class of men, socially and intellectually.

Such are a few of the main features of the Association, some of which, it cannot be denied, are very desirable. But without questioning its feasibility in every detail, or even its possible success, it may be permitted to doubt if there is really any necessity or cause for such an association. Will there really be any benefit result to its members? for this is a point upon which, to a great extent, its success must depend. May there not be disadvantages equally as great? Let it be remembered that draughtsmen are not employed by the score at a time. Besides, might not any society which tended to deal, however indirectly, with the salaries or working hours of draughtsmen, have the effect of lowering instead of raising the standing of the profession?

In the meantime many will watch the proceedings of the National Association of Draughtsmen with curiosity if not with interest.

## TRIAL OF A TORPEDO BOAT BURNING LIQUID FUEL.

A FINAL and very successful trial was made at Portsmouth on Friday, March 1st, of a torpedo boat built and engineered by Messrs. Doxford & Son, of the Pallion Works, Sunderland, in which liquid fuel is used for generating steam instead of coal. The oil, which consists of creosote, the refuse of the chemical works, is stored in tanks in the double bottom, and the tanks are capable of storing about 14 tons. It is pumped into air chambers in the stokehold, whence it is projected into the furnace by means of 31 burners (though at the trial only 28 were used) in the form of spray. The boat was under way at full power for about two hours, during which the following data were obtained:—Steam in boiler, 158·6 lb.; vacuum, 23 in.; and revolutions, 312. The mean pressures and indicated H.P. of the cylinders were not calculated, but the collective H.P. developed was about 900. Five runs were made during the trial upon the measured mile in Stokes Bay, the mean speed being 19 knots. The whole question resolves itself into one of cost. The oil consumed was purchased at 2½d. per gallon, or in round numbers at about £2 per ton, whereas the Admiralty contract for coal is at 14s. per ton. But whereas a pound of coal will evaporate 10 lb. of water, oil will evaporate about 15 lb. This still leaves an important superiority in favour of coal at existing prices in England. On the other hand, there are several advantages accruing from the consumption of oil. There is no dust, and little or no smoke. Trimming is also dispensed with, the potential energy, weight for weight, stored on board, is one-half greater, and the supply of steam, since it is free from the inequalities of stoking, is likely to be more constant.

## THE GRAYDON TORPEDO PROJECTOR.

IT has always been seen that if torpedoes could be projected through the air in the same way that a shell is fired from a gun, instead of being propelled through water, far greater ranges could be attained and far better results generally would accrue. Lieutenant Zalinski, of the United States, has, we believe, been the first to produce a practical pneumatic gun for throwing torpedoes charged with dynamite through the air. Judged, however, by the light of what has followed since Zalinski's gun was developed, it would seem to have several drawbacks. It is of great length—namely, 55 ft. is rigidly fixed, and, according to its inventor, fires a 600 lb. charge of dynamite no greater distance than one mile. Another worker in the same direction is Lieutenant Graydon, late United States Navy. The Graydon torpedo projector consists of a gun, or discharging tube, with air reservoirs and compressing apparatus, by means of which it is proposed to throw from

6 lb. to 1,200 lb. of dynamite for distances ranging up to three miles. The projectors are to have calibres of from 3 in. to 21 in. and to be worked under air pressures ranging up to 5,000 lb. per square in. The torpedo projectors are designed for work such as is effected by heavy siege guns as well as for field use, firing shrapnel, as an adjunct to light artillery, and for the efficient working of which provision has been made in detail by the inventor. The gun is only half the length of the Zalinski gun, while it can be elevated or depressed as required. The torpedo will be discharged through the air at an object—say, an enemy's ship—and, when near it, will sink to a given depth and automatically explode close to the vessel to be destroyed. The torpedo charge is exploded by an ingenious electric arrangement actuated by the pressure of the water. If, for example, it is desired that the charge shall be exploded at 20 ft. below the surface of the water, the firing mechanism is set accordingly, and when the torpedo has sunk to that depth the pressure of the water causes electrical contact to be made and the torpedo is fired. An important feature is the safety arrangement devised by Lieutenant Graydon for preventing the premature explosion of the dynamite in the torpedo by heat or concussion. This arrangement is applicable to artillery shells generally as well as to torpedoes. The interior of the projectile is lined with asbestos cloth, which is an excellent non-conductor of heat, and the charge of dynamite is divided up into a great number of small pellets, each enclosed in an envelope of prepared paper. Thus the whole charge is cushioned and protected piecemeal against explosion from shock during transport, storage, and handling, in fact until the moment arrives when it is to be exploded. The success of the Graydon torpedo projector depends, among other things, upon the high pressure at which the air is used and which is attainable by means of high compressing power. The system is being applied on board the ram vessel designed by Rear-Admiral Ammen, of the United States Navy. We understand that arrangements are also being made to test the invention in a practical manner in this country, as regards both the torpedo projector and the safety dynamite shell. The torpedo system is stated to be adaptable for use on board merchant and passenger steamers, which could be easily fitted to carry them in view of war contingencies.

## THE TWIN-SCREW SLOOP "BEAGLE."

ON February 28th the *Beagle*, the keel of which was laid in No. 5 dock on the 14th of May last year, was floated out at Portsmouth. Miss Deadman, eldest daughter of the Chief Constructor of the yard, bestowed the name upon the ship. The *Beagle*, which had been afloat for a few days previously for the purpose of ascertaining her freedom from leakage, was then towed into the shipping basin. She is a twin-screw sloop, having for her sister the *Basilisk*, building at Sheerness, and practically resembles in dimensions, armament, and other respects the *Nymphæ*, *Buzzard*, and *Daphne*. An important and novel innovation, however, has been introduced into her construction. Her predecessor, the *Nymphæ*, was composite built—that is, with steel frames upon which were worked two thicknesses of teak, and coppered; but in the case of the *Beagle* a complete steel bottom has been worked on the frames and covered with only a single thickness of teak for carrying the copper sheathing. Considerable interest is felt as regards the result of the experiment, as a double thickness of wood has hitherto been held to be indispensable to insure perfect insulation between the copper and the steel frames, and prevent galvanic action. In dimensions the *Beagle* measures 195 ft. between perpendiculars and 30 ft. in beam, and has a mean draught of 12 ft. 5 in. with 160 tons of coal on board, and a displacement of 1,170 tons. Over the machinery and boiler spaces is a thin, watertight protective steel deck, and extra protection is also afforded by means of coal stowed in bunkers between the watertight and upper decks. The armament of the *Beagle* will consist of eight 5-in. breechloading guns on Vavasseur central pivot mountings, and six Nordenfeldt and a couple of Gardner machine guns. The machinery will be supplied by Messrs. J. & G. Rennie, of London, and consists of two sets of horizontal, triple-expansion, direct-acting engines. The collective H.P. will be 2,000, and it is expected that a maximum speed of 14½ knots will be realized. The *Beagle* is intended for distant foreign service.

### TRIAL OF H.M.S. "MEDUSA."

HER Majesty's ship *Medusa*, the second of the five cruisers known as the *Medea* class, completed her contractor's trials off the Nore on Wednesday, March 13th. Her engines are of the vertical triple-expansion type, and are identical in design with those of the *Medea*, already described in our columns, pages 135 and 349, Vol. 10, being manufactured by Messrs. Humphrys, Tennant & Co., of Deptford.

The natural draught trials took place at sea on Tuesday, March 5th, and proved highly successful. The ship was tested for 12 hours under natural draught with the following results:—Revolutions, 131; mean H.P., 6,334 (834 above the contract); mean speed, 18.005 knots.

Mr. Robert Humphrys was in charge of the machinery, while Mr. Durston represented the Admiralty. There were also present Mr. Beaton, from the Constructor's Department, Mr. Froude, of Haslow, Mr. Oram, and Mr. Andrews representing Chatham Dockyard, where the ship was built. No hitch of any kind occurred from first to last, the boilers developing an abundant supply of steam, with considerably less than the half-inch of air pressure allowed. The engines worked admirably throughout, surpassing with ease the 5,500 I.H.P. which was contracted for. The run was made from the Nore to Knock Point and back. During the last three hours a number of runs were made on the measured mile to afford information as to the probable behaviour of the ship on her progressive trials, which are to take place at Portsmouth, after her return from the forthcoming naval manoeuvres. She had been docked just before leaving Chatham and her bottom cleaned and painted for this purpose. The mean results of the trial were as follows:—Mean steam pressure in boilers, 152.5 lb.; vacuum in condensers—starboard, 27.8; port, 27.8; revolutions per minute—starboard, 129.9; port, 130.5; collective I.H.P., 6,334; speed, 18.005 knots.

The four hours' full-power trial under forced draught, which had been delayed owing to the fogs, took place on Wednesday, March 13th, Mr. R. Humphrys being again in charge of the machinery, Mr. Soper representing the Admiralty; Mr. Beaton, of the Constructor's department, and Mr. Andrews, of Chatham Dockyard, also being present. The contract power was for 9,000 indicated H.P., which was easily surpassed, the trial being in every respect satisfactory, though it was found impossible to run on the measured mile from the foggy and crowded state of the Channel. The mean results were as follows:—Mean steam pressure in boilers, 149 lb.; mean air pressure in stokeholds, 1.9 in. of water; vacuum in condensers—starboard, 26.5; port, 26.6; revolutions per minute—starboard, 143.6; port, 143; collective I.H.P., 9,435.3. At the close of her trials the ship proceeded to Chatham, where she will be completed in readiness for the manoeuvres.

### NEWCASTLE STEAM BOILER INSURANCE COMPANY, LIMITED.

THE tenth annual ordinary general meeting of the Newcastle-on-Tyne Steam Boiler Insurance Co., Limited, was held at the office of the company, 34, Grey Street, Newcastle, on March 11th. The chairman of the company (Mr. George Davidson) presided, and there was a good attendance of shareholders.—The Chairman having called upon the secretary to read the notice convening the meeting, moved the adoption of the directors' report, balance-sheet, and engineer's report.—After several remarks and satisfactory answers to various questions, the motion was seconded by Mr. John Lamb, and carried unanimously.—The Chairman next referred to the clause in the directors' report regarding the lamented death of the late chairman, Alderman Thomas Grey, of Spital Hill, Mitford, and expressed the satisfaction it had given him to have been appointed chairman by his co-directors, as Mr. Gray and he had been two of the original founders of this successful company.—The dividend of 7½ per cent. proposed by the directors, was moved by the Chairman, and seconded by Mr. John Lamb (architect to the Grainger Estate).—Upon the motion of Mr. John Lamb, seconded

by Mr. J. J. Gillespie, Mr. G. R. Brewis was re-elected a director.—Mr. Thomas Gillespie moved, and Mr. Campbell, C.E., seconded, that Mr. Simon Tate, mining engineer, and Mr. Councillor John Armorer Baty, Cattle Market Exchange, be appointed directors in room of the late chairman and Mr. W. N. Atkinson, Government Inspector of Mines, resigned. Carried.—Mr. G. R. Brewis (railway advertising lessee) moved, and Mr. George Bradford (mining engineer) seconded, that Messrs. Gillespie Brothers & Co. be elected as auditors for the ensuing year. The resolution was agreed to.—Mr. Lamb, in moving a vote of thanks to the Chairman, which was seconded by Mr. Campbell, C.E., embraced the opportunity of congratulating him, as a very old friend of 30 years' standing, upon his appointment to the chairmanship.—The meeting afterwards concluded.

### THE LÉGÉ TORPEDO.

FOR some time past Mr. A. Légé has given his attention to the production of a torpedo based, broadly, upon the principle of a flying kite. The weapon, therefore, belongs to the class known as towing torpedoes, and so far there is a similarity between it and the Harvey torpedo, but beyond the actuating principle the resemblance does not extend. The Légé torpedo is fish-shaped, 7 ft. long by 11 in. maximum diameter, and carries a charge of 50 lb. of gun-cotton, dynamite, or other high explosive. The torpedo itself weighs 80 lb. without the charge, and is designed for either attack in the open or for river or harbour defence. It is made of delta metal, that being the material used in constructing Whitehead torpedoes, for which purpose it is well suited on account of its strength and capacity of resisting the corrosive action of sea water. Outside the fish-shaped body are two blades or fins, one on either side, a tail-piece and a rudder, the fins and tail-piece being actuated by the expansion and contraction of an elastic metallic air chamber, placed inside the torpedo and exposed to the pressure of the water. The torpedo is loaded with cork, so that its specific gravity when charged is a little greater than that of water. When placed in water it gradually sinks to the bottom, and the pressure of the water acting on the elastic air chamber causes the fins and tail piece to assume an angle which directs the torpedo quickly towards the surface when the tow-line is hauled upon. On nearing the surface the water pressure decreases, and with it the angle of the fins, so that the torpedo is then towed at a level a little below the surface. The charge is fired by hugging contact, the firing pin projecting from the nose of the torpedo. A key locks the firing pin until the torpedo is placed in the water, when it is withdrawn by a line. The firing apparatus is also locked from the inside by a spring bolt connected with the tow-line, but remains unlocked while the weapon is being towed, or while there is a pull upon the tow-line. In operation the torpedo is to be dropped into the water and a long length of tow-line payed out from a launch, which is to proceed to the far side of the enemy's ship. The torpedo is then towed so as to hug the ship, and catching against the torpedo-net, with which it is assumed the ship will be protected, it is stated that the torpedo will overbalance, dive under it, and come up nose forwards against the bottom of the ship and explode. It is claimed that should a torpedo miss its aim or get adrift it will not be dangerous, owing to the internal locking arrangements. It is proposed to tow several of these torpedoes in a group, radiating fan-like from the launch, the rudder of each being first set to keep it on its own proper course, a long line of attack being thus formed. For the defence of harbours or the mouths of rivers an arrangement is proposed for keeping a series of these torpedoes slowly moving on an endless chain under water, so as to catch any vessel that may attempt to enter. The weight of a Légé torpedo is very small as compared with that of a Whitehead torpedo of similar power. A 4 ft. 6 in. Légé weapon weighs 35 lb. plus a 30-lb. charge, while a Whitehead torpedo carrying a 35-lb. charge is stated to weigh 6 cwt., and to measure 15 ft. in length. It also carries in its pull expensive machinery, which the Légé does not, so that the cost of the latter is very considerably less. It is intended shortly to carry out a series of experiments with the Légé torpedo in order to demonstrate its practicability, which, however, Mr. Légé states he has already proved by smaller torpedoes.

## NEW SHIPS FOR H.M. NAVY.

THE following return was issued on March 19th of the number of ships, including those in the proposed new shipbuilding programme, which will be added to H.M. Navy in the period between the 1st of April, 1889, and the 1st of April, 1894:—

I.—SHIPS IN PROGRESS.			
Class of Ship.	Displacement Tonnage.	Indicated H.P.	Name.
	10,600	11,500	Camperdown*
Battle Ships, 1st Class*	11,940	12,000	Trafalgar
	11,940	12,000	Nile
	10,470	14,000	Victoria
	10,470	14,000	Sans Pareil
1st Class Protected Cruisers*	9,000	20,000	Blake
	9,000	20,000	Blenheim
2nd Class Protected Cruisers..	2,950	9,000	Melpomene
	2,950	9,000	Magicienne
	2,950	9,000	Marathon
	1,830	6,000	Barham
	1,830	6,000	Bellona
3rd Class Protected Cruisers..	1,580	3,000	Barrosa
	1,580	3,000	Blanche
	1,580	3,000	Blonde
	1,580	3,000	Barracouta
Torpedo Depot Ship	6,620	12,000	Vulcan
	735	4,500	Sharpshooter
	735	4,500	Salamander
Torpedo Gunboats..	735	4,500	Seagull
	735	4,500	Spanker
	735	4,500	Speedwell
	735	4,500	Sheldrake
	735	4,500	Skipjack
Sloops ..	1,170	2,000	Beagle
	1,170	2,000	Basilisk
	805	1,200	Magpie
	805	1,200	Redbreast
	805	1,200	Redpole
	805	1,200	Sparrow
Gunboats, 1st Class	805	1,200	Thrush
	805	1,200	Lapwing
	805	1,200	Ringdove
	805	1,200	Widgeon
	805	1,200	Goldfinch
Sailing Training Brig Ships for Service in Australian Waters:	508	—	Mayflower
	2,575	7,500	Pandora
2nd Class Protected Cruisers..	2,575	7,500	Pelorus
	2,575	7,500	Persian
	2,575	7,500	Phoenix
	2,575	7,500	Psyche
Torpedo Gunboats	735	4,500	Whiting
	735	4,500	Wizard

Total number of ships in progress .. ..	43
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\*In addition to the ships above mentioned, the 1st Class Battle Ships, *Howe* and *Camperdown*, and the Belted Cruisers, *Australia*, *Galatea*, *Immortalité*, *Narcissus*, and *Aurora*; also the 2nd Class Protected Cruisers, *Medea* and *Medusa*, will be practically complete by March 31st, 1889, with the exception of guns not yet delivered.

## II.—SHIPS TO BE BUILT UNDER THE NEW PROGRAMME.

Class of Ship.	Displacement Tonnage.	Indicated H.P.	Number to be built.
Battle Ships, 1st Class ..	14,150	13,000	8
Battle Ships, 2nd Class ..	9,000	10,000	2
Cruisers, 1st Class, Protected ..	7,350	12,000	9
Cruisers, 2nd Class, Protected ) improved <i>Medea</i> type .. }	3,400	9,000	29
Cruisers, 2nd Class, Protected ) <i>Pandora</i> type .. .. }	2,575	7,500	4
Torpedo Gunboats, <i>Sharp-</i> <i>shooter</i> class .. .. }	735	4,500	18
			70

Class of Ship.	No.
Battle Ships, 3rd Class .. ..	4
Cruisers, 2nd Class, Unprotected ..	1
Cruisers, 3rd Class, Unprotected ..	7
Sloops, Unprotected .. ..	8
Gun Vessels, 2nd Class .. ..	4
Gunboats, 2nd Class .. ..	6

<b>Total</b>	..	..	..	<b>30</b>
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J. O. HOPKINS, Rear-Admiral, Controller of the Navy.  
March 11th.

**NOTE.**—In addition to this list there will be many other vessels in the course of the next five years which, though not considered to be worth repairing, re-arming, re-boiling, &c., at a large expense, on account of their obsolete character, slowness of speed, &c., will be sufficiently sound in hull and boilers to be utilised in case of emergency for such further special service as may be found convenient to employ them on, and these have accordingly not been shown as probable removals.

**TORPEDO BOATS FOR THE GERMAN NAVY.**—A correspondent writes from Hamburg:—"The construction of 16 additional sea-going torpedo boats for the Imperial German Navy has been entrusted by the Admiralty to Messrs. Schichau's shipbuilding yard at Elbing. These boats will be furnished with apparatus for the launching of torpedoes, and will be armed by machine-guns. The I.H.P. is to be 1,500, which is calculated to furnish the boats with a speed of 23 knots. Several of the vessels are already so advanced that their launch from the stocks is only a question of a few days."

## "VALVOLINE" AS A LUBRICANT.

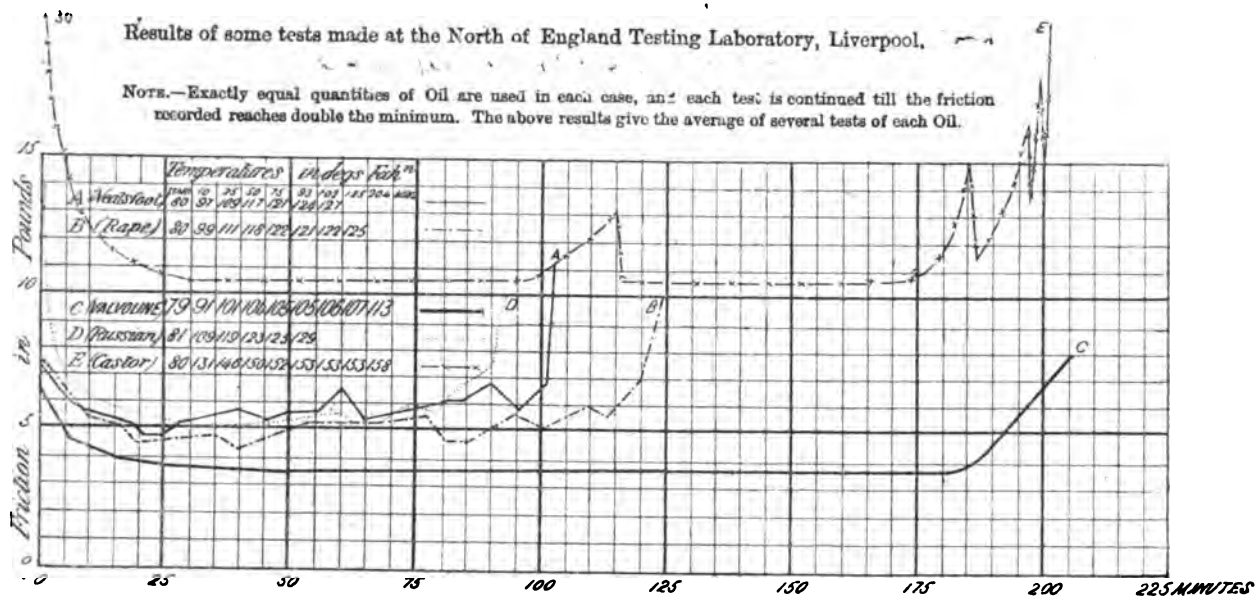
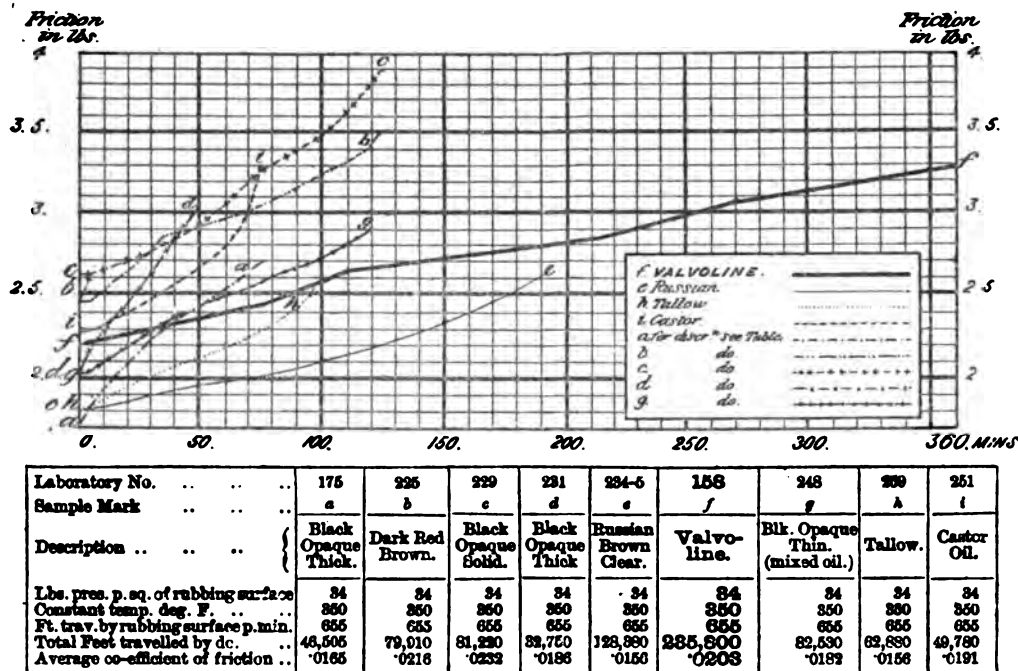


DIAGRAM No. 1.



NOTE.—Exactly equal quantities of Oil are used in each case, and each test is continued till the friction recorded reaches double the minimum. The above results give the average of several tests of each Oil.

DIAGRAM No. 2.

III.—ABSTRACT OF SHIPS, INCLUDING THOSE PROPOSED IN NEW SHIPBUILDING PROGRAMME, WHICH WILL BE ADDED TO H.M. NAVY IN THE PERIOD BETWEEN APRIL 1st, 1889, AND APRIL 1, 1894:—

Class of Ship.	Now in Progress. No.	To be built under the New Programme. No.	Total. No.
Battle Ships, 1st Class ..	5	8	13
Battle Ships, 2nd Class ..	—	2	2
1st Class Protected Cruisers ..	2	9	11
2nd Class Protected Cruisers ..	3	29	37
2nd Class Protected Cruisers for Australia ..	5		
2nd Class Protected Cruisers, Pandora type ..	—	4	4
3rd Class Protected Cruisers ..	6	—	6
Torpedo Depot Ship ..	1	—	1
Torpedo Gunboats ..	7	18	27
Torpedo Gunboats for Australia ..	2		
Sloops ..	2	—	2
1st Class Gunboats ..	9	—	9
Sailing Training Brig..	1	—	1
Total ..	48	70	118

J. O. HOPKINS, Rear-Admiral, Controller of the Navy.  
March 11th.

### "VALVOLINE" AS A LUBRICANT.

IN these days of ever-increasing pressures and consequently higher temperatures and greater strains it becomes a matter of primary importance in selecting a lubricant to look to its efficiency rather than to its cost, in fact the neglect of this may not only mean the difference between economical working and not even being able to work up to the stipulated contract H.P. (as occurred in the trials of a large vessel recently brought under our notice), but it may also mean the absolute eating away, owing to the acids in the inferior lubricants, of the vital parts of the machinery.

Animal and vegetable oils both labour under disadvantages sufficient to place them *hors de combat* as lubricants of our present high pressure days; chief among these disadvantages must be noted their tendency to dry up under atmospheric action and leave a sticky gum on the bearing, a fatal defect when employed on high speed machinery, while, further, their aptitude for injuriously attacking the metal they come in contact with materially assists in shortening the lives of boilers, cylinders, bearings and condensers.

Undoubtedly the lubricant for present day use is to found in mineral oil properly prepared for the purpose. If improperly prepared the mineral oils possess all the disadvantages of animal or vegetable oils, and though, perhaps, not in such a pronounced degree, yet the defects are there; in fairness to the mineral oils, however, we should say that these defects are rather introduced into them by bad treatment than hereditary with them. The objections referred to are caused in the later named oil by the presence of acids used to clarify and (so fastidious have we become) deodorise them, and also by their distillation having been effected by dry heat, which burns the oil to such an extent as to totally destroy its lubricating properties.

Now to overcome these defects and to produce a lubricant which should meet all requirements as regards efficiency, and at the same time compare favourably with all other first-class lubricants as to price, Messrs. Boulton Brothers & Co. introduced to the English market Messrs. Leonard & Elliss's now universally-known "Valvoline," a preparation made from a very superior quality of crude petroleum, from which the volatile oils are driven off by superheated steam, and as no acid whatever is used in the process of refining, and the whole of the bitumen and solid impurities are removed by repeated filtration through animal charcoal, the resultant is a pure oil lubricant of the very highest quality.

These oils, known under the general title "Valvoline," do not acidify by exposure to the air; they cannot oxidise any substance with which they come in contact, while in the boiler they remain unaltered because they cannot be saponified, and because their decomposition requires a higher temperature than is attained in the boiler.

We may here state that "Valvoline" is a generic phrase, and was brought into existence by the requirements of the Trade Marks Act, and not, as seems to be current opinion, from its being only applicable to valve lubrication; in fact, we believe Messrs. Boulton Brothers import some five or six varieties of the oil, among them being the well-known "Cylinder," "Locomotive," "Machine," and "Loom and Spindle" oils.

As concisely proving the superiority of "Valvoline," we cannot do better than refer to the accompanying diagrams, No. 1 of which we may briefly sum up by saying that "Valvoline" does 62 per cent. more work with 25 per cent. less friction, and the generation of 25 per cent. less heat than the best of the other three lubricants, so proving itself worth twice as much as any of the others, while, as a fact, it actually costs less money. Diagram No. 2 is compiled from tests made on perfectly clean surfaces, at the North of England Testing Laboratory, on a machine specially designed for testing cylinder oils, and from it "Valvoline" is shown to do 84 per cent. more work than the best of the other oils. In this connection it may be well to note that "Valvoline" cylinder oil stands 600 degrees of heat, and for all high pressure, high speed machinery, it is unequalled.

It is in use on some of the fastest steamers afloat, not only for the main, but also for the auxiliary engines, and more especially is it finding favour with the electric light engineers, one of the largest firms quoting it exclusively in their new catalogue. The manager of a very large electric light installation in London, where two sets of engines of the inverted compound marine type are used, reports a saving of £3 15s. per month, due entirely to the use of "Valvoline" oils in place of other lubricants.

As showing that, spite of its price being a little above that charged for "cheap" lubricants, "Valvoline," when once used, is not readily given up, we may mention that on the 36 steamers of Messrs. Robt. MacAndrew & Co., it has held its own against all comers for more than fourteen years; while other firms testify to its worth after, in many cases, six, eight, and ten years' constant use.

To those of our readers who have not yet given the "Valvoline" oils a trial, we would recommend an application to Messrs. Boulton, Bros. & Co.'s Liverpool or London offices for a quotation, and we think that, after using them for some time, they will say of lubricants as of other things, "the best is cheapest" in the long run.

### PICKARD'S SYSTEM OF CANAL TRANSPORT.

IN a recent issue we briefly noticed a novel system of canal transport devised and patented by Mr. Arthur Pickard, of Leeds, and we now have pleasure in herewith illustrating a typical method of carrying Mr. Pickard's scheme into practice.

It will be noticed from the plans that an engine, housed between the high and low level canals, supplies the power to actuate two paddle-wheels so placed as to impart motion to the water in the manner indicated by the arrows. By this means an outward flow is given to the water in what may be termed the outwards reach of the canal, and conversely an inwards flow is set up in what may be called the homewards reach, a large orifice near the end of each length of canal permitting of the return flow of the water. From the plan and section on the line A A. it will be noticed that there is a smaller orifice at or about the very end of each length, this serving to set up the outwards and homewards streams to the extreme ends, and hence a vessel or barge may be

drawn away from, or impelled up to, the very end walls themselves.

Turnouts, or wharves, are placed at any convenient distance apart, and on either or both sides of the canal, as shown on the plate, a suitable gate allowing of these being cut off from the main stream without in any way interfering with its course.

The vessels which Mr. Pickard prefers to use in conjunction with his system are constructed, as shown, in the form of long rectangular boxes, mounted on wheels and provided with double watertight lids. The loaded vessels are raised from level to level, or from the canal to the ground, either by a steam or hydraulic crane, situated in convenient proximity to the main engine-house from whence power to it is supplied; or a convenient form of portable inclined plane, as shown, may be used, the incline being provided with rails laid to correspond with the gauge of the wheels on the vessels.

Mr. Pickard claims, and we think justly so, for his system that the expenditure of power to set up the flow of water, and so convey any number of vessels, limited only by the length of each reach, will be infinitely small as compared with the total aggregate power that would be required to individually propel the same number of vessels. Further, this system lends itself to the construction of canals in pretty much the same manner as railways are constructed, each reach being built up of iron plates in the form of a long conduit and laid on the ground without any need of the costly excavation necessary when constructing an ordinary canal, and as it is a well-known fact that canal transport is the cheapest method of moving goods, it seems to us that Mr. Pickard has a large field before him.

To those of our readers who may feel interested in the subject we would commend a visit to Messrs. Pickards' offices (114, Newgate Street, E.C.), where models may be seen and all information obtained; and to those who may desire a practical test of the capabilities of Mr. Pickard's plan, we would recommend a visit to the forthcoming Exhibitions, where it has been arranged to fit up miniature canals, on which passengers will be carried, and which, we doubt not, will form one of the chief attractions of the season. We understand that a Joint Stock Company is being formed to work the patent, particulars of which will be supplied by Messrs. J. O. Chadwick & Sons, of 95, Finsbury Pavement, E.C.

### THE TORPEDO BOAT BUILDING WORKS OF HERR F. SCHICHAU.

WE have pleasure in herewith presenting a double-page illustration of Herr Schichau's famous torpedo boat building works at Elbing. This establishment was founded by the present proprietor, Mr. Ferdinand Schichau, in 1837, and by great zeal and intelligence the undertaking has grown under the care of the proprietor, until at the present day employment is found for nearly 3,000 hands.

The establishment is divided into the following departments—locomotive factory, dockyard, engine factory, and repairing department in Pillau, and to

these have recently been added the newly-established dockyards at Danzig, which have been fitted out in the best style, and on the most modern lines, the best machinery procurable only being used. The new dockyard in Danzig covers an area of 75 Prussian acres, and it is so constructed that even ironclads of the largest class can be built there. It is intended to begin active building operations in the autumn of the present year.

In view of the fact that one of the specialities of Herr Schichau's firm in Elbing is the building of torpedo boats and torpedo cruisers, we cannot but think that our illustration will prove of great interest to our readers, especially when it is borne in mind that more than 160 of these deadly craft have already been manufactured in the yard and works depicted.

We sincerely congratulate Herr Schichau on the wonderful progress he has made with both the engine and shipbuilding departments, and we are glad to know that his zeal in the cause has been so amply rewarded by extensive orders not only from his own Government, but also from so many other nations.

### COOPER'S IMPROVED PATENT SLIDE-VALVE INDICATOR.

COOPER'S Improved Patent Slide-Valve Indicator is an instrument likely to be extensively used when better known, and we have pleasure in drawing the attention of our readers to it. It is intended to supply marine engineers and all practically interested in the economical use of steam with the means of readily and accurately ascertaining the motion and action of a slide-valve. In less than five minutes, by its use, is given all the information that can be obtained from turning the crank-shaft of an engine once round, and noting the various points of interest in relation to the slide-valve and steam ports for one revolution. In addition it also shows the exhaust port and its relative positions to the steam ports by the varied action of the slide-valve at every point of the stroke, whether the valve is coupled direct to the eccentric rod, or by levers, or by link motion. Necessarily it supplies an accurate and quick method of comparison of different valves, revealing excellences or faults, and along with the use of the ordinary cylinder indicator adds to the usefulness and interest of indications. The instrument is so arranged that the connecting-rod of the engine may vary from  $1\frac{1}{2}$  to 3 times the length of the stroke, and for engines having connecting-rods below or above these limits, the patentee can make special instruments to meet their requirements. The slide-valve to be indicated may have equal or unequal laps, or lead, inside, outside, or combined; and when applied to an engine with the link motion, its utility is shown in its adaptability to either full gear or any grade of expansion that can be effected with that arrangement, and shows the contraction of the steam port by using the reversing link as a means of expansion.

In our illustration of Cooper's Slide-Valve Indicator, A A is the frame carrying the moving parts; B is a long slot in which slides the block C, corresponding to the piston of an ordinary engine; D is a small slot.

parallel with the long slot B, and graduated on one side, giving various lengths of connecting-rod proportionate to the length of stroke; E is an adjustable graduated scale, on which may be read off the various positions of the piston C, either on the in or out stroke; F is a swivel-coupling for fixing any length of connecting-rod in relation to the stroke of the engine; H is a crank pin for giving motion to the connecting-rod, and is fixed to the bead-wheel J, shown partly in dotted lines; K is a centre-stud carrying the bead-wheel and pinion-gearing into and driving the bead-wheel and crank. The milled-wheel N works the whole instrument. There is a centre slot, in which are placed R R transverse sliding-plates to indicate the lap and lead of the valve. T is a sliding pointer, adjustable in length by a small screw, and fixed to turn with the crank; which may be set to any angle to the crank, as required by a milled nut. An arm, graduated in inches is used for adjusting the length of the pointer T.

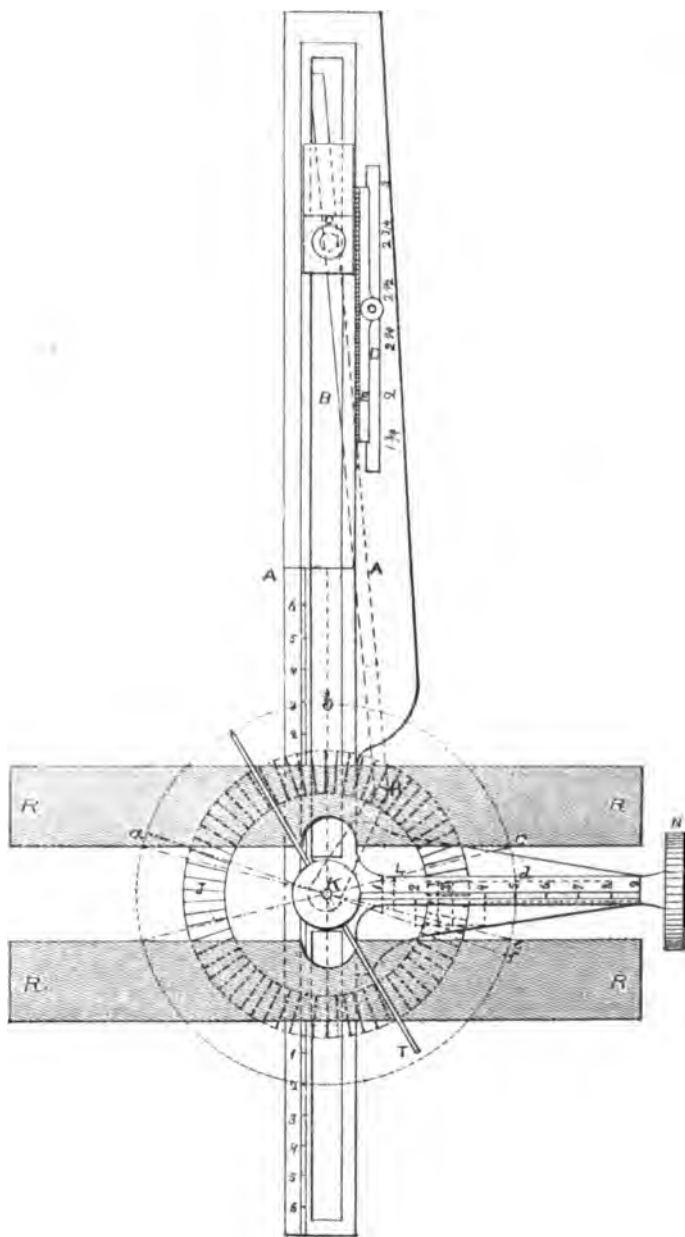
Before describing the manipulation of the Improved Patent Slide-Valve Indicator, it may be interesting to enumerate the variety of information which can be obtained by its use. The various points of interest are twelve in number, viz. :—

1. The distance the piston has travelled when the steam port is full open.
2. The width of the steam port opened, and how much this varies by using the reversing link as a means of expansion.
3. At what point in the stroke the valve closes, cutting off the steam, and expansion begins.
4. Similarly, when expansion ceases by the opening of the steam port to the exhaust port.
5. The portion of the stroke that is completed under the expansive action of the steam.
6. The point in the stroke when the exhaust port closes, and compression begins.
7. The portion of the stroke performed against the compressive action of the steam.
8. The point in the stroke where the steam port is opened by lead, before the piston commences its stroke, steam being admitted in opposition to it, and true compression ceasing.
9. The portion of the stroke performed against the steam admitted by lead.
10. The lead having been either assumed or taken from an existing engine, for one end of the cylinder, the instrument will give it at the other end.
11. When used in connection with indicator diagrams from the cylinder, the whole or any of the above data may be marked on the diagram, thus ensuring its correctness, as a glance will show if it has been altered to please the eye.
12. This Slide-Valve Indicator will also show the effect of various lengths of connecting-rods in cutting off the steam, &c., and that the admission, cut off, &c., for the in-stroke is quite different to the out-stroke, &c.

The following instructions, along with our illustration, will demonstrate how the Improved Slide-Valve Indicator is used :—

Turn the crank on to the centre, either the top or bottom, then adjust the scale E to the required length of connecting-rod, by bringing the centre of the scale

opposite the proper length of the rod, then ease the set-screw and adjust the piston to the zero on the scale E. The zero on this scale is either at the top or bottom, as the crank is either on the top or bottom centre, and E is doubly marked, reading both up or down, as the case may require. Next move the two plates R R from the centre, a distance equal to the lap of the valve. If we suppose



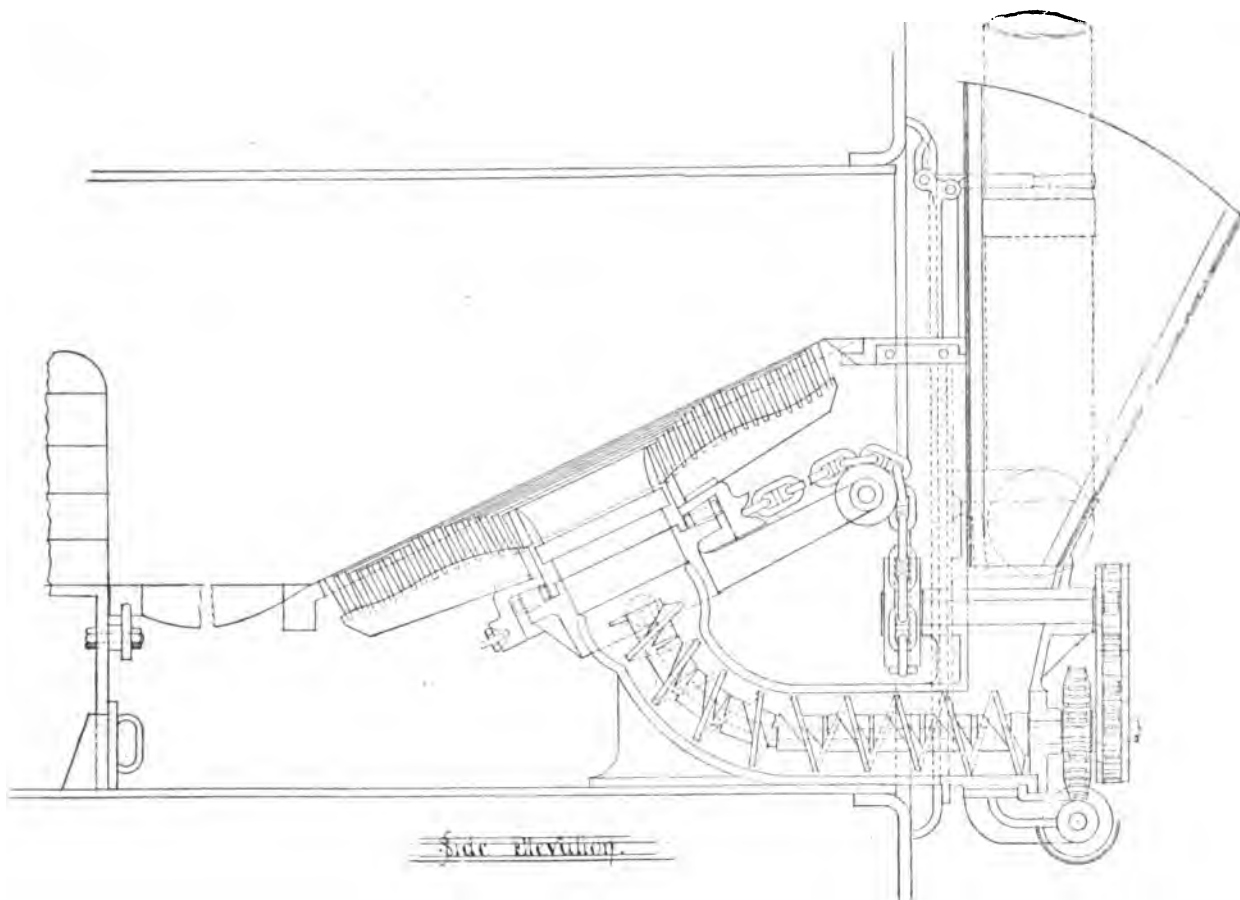
the crank to be on the bottom centre, then move the pointer T across, and set it to half the travel of the valve, and fix it by its centre screw, then turn the bent point up towards the piston until it crosses the first edge of the lead plate R such a distance as will equal the lead required, and fix it there by the milled nut; it will be seen that the point of the needle now actually becomes the centre of an

eccentric; and its position with regard to the crank is the same. The instrument is now ready for taking the whole or any of the data. By turning the wheel N, the needle moves from its position towards the top of the circle which it describes.

When it reaches *b* the valve is full open, and the distance from R to the end of the needle shows the opening of the port. When the needle reaches the edge of the plate R at *c*, the valve is closed, and when, by continuing the motion, the needle reaches the centre line at *d*, the exhaust (if the valve has

engineer, Baltic Chambers, Newcastle-on-Tyne, who has compiled an elaborately-illustrated pamphlet on the description and use of his Improved Slide-Valve Indicator, on which numerous detailed examples of its operations are fully described.

Not only does this Indicator appear to be of great use in every-day work, but it is evidently adapted for rapidly enabling the designer to obtain the most suitable proportion for a valve to work under given conditions, and we trust its merits will obtain the wide recognition they deserve.



THE HOPCRAFT PATENT FURNACE.

neither inside lead or lap) begins on one side and compression of the other.

Again, when the needle reaches *e*, compression ceases, and lead begins before the crank is on the centre. Finish the stroke by turning the wheel a little further, bringing the crank on the other centre. The needle will then be at *f*, and the distance from *f* to the edge *e* will be the lead the valve has at the other end. Continue the motion for the other stroke, and at each of the points above-named read off the position of the piston with regard to the scale E.

The lead plates and the arm are removable for the purpose of packing the Indicator in the small space of 23 in. by 5 in. by 4 in., and the weight of it, including case, is only 11 lb.

The patentee is Mr. William Cooper, consulting

### THE HOPCRAFT PATENT FURNACE.

THROUGH the courtesy of the Hopcraft Furnace Company, of 37, Walbrook, E.C., we are enabled to publish the accompanying drawings illustrative of the latest form of this very successful self-stoking furnace grate.

We say very successful grate for it is a fact that though comparatively unknown in the market, this grate is not by any means an untried one, it having been in use at Sir Joseph Causton & Sons' works for more than twelve months, during which time it has given unqualified satisfaction and proved to demonstration its great economy in fuel and wear-resisting power. It was after seeing it in use at these works and noting the high terms of praise in which the head manager to

that large firm spoke of it, that Mr. A. Williams, the managing director of the Victoria Steamboat Association allowed his vessel, the *Lotus*, to be fitted. The result of this trial order was that Mr. Hopcraft received instructions to immediately fit the whole of the furnaces in six of their steamers, with the view of following this order with instructions to fit their entire fleet of 30 vessels.

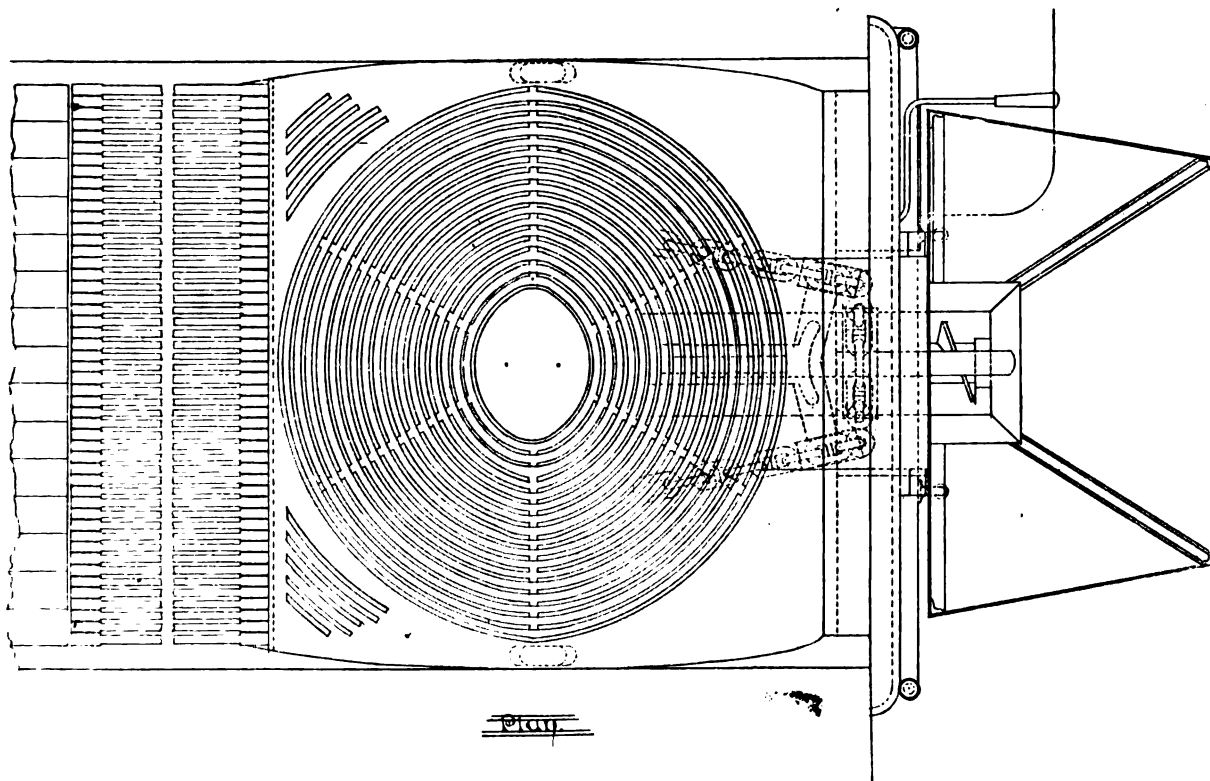
As will be seen from the drawings, the coal (smaller the better) is underfed into the fire in conjunction with a mechanically-induced or forced draught, the rate, or quantity of feed and the supply of air being each under perfect control.

The coal is fed from a hopper placed so that its inlet is only breast high, thus keeping it clear of smoke

to the higher level in the course of the revolution of the grate.

An induced or forced draught, either on the closed ashpit or stokehold system, is used; the air supply being in direct communication with, and controlled by, that of the coal feed, the relative proportion of air to coal remaining practically constant, whether 10 lb. or 40 lb. of coal and upwards are being consumed per square foot of grate surface per hour.

The coal, as already mentioned, is delivered upwards into the body of incandescent fuel on the grate, on nearing which, a distillatory or gas-evolving process commences. The products of distillation, otherwise the smoke-producing constituents of the coal, having to pass up through the incandescent fuel on the grate,



THE HOPCRAFT PATENT FURNACE.

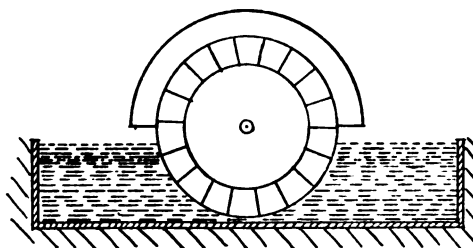
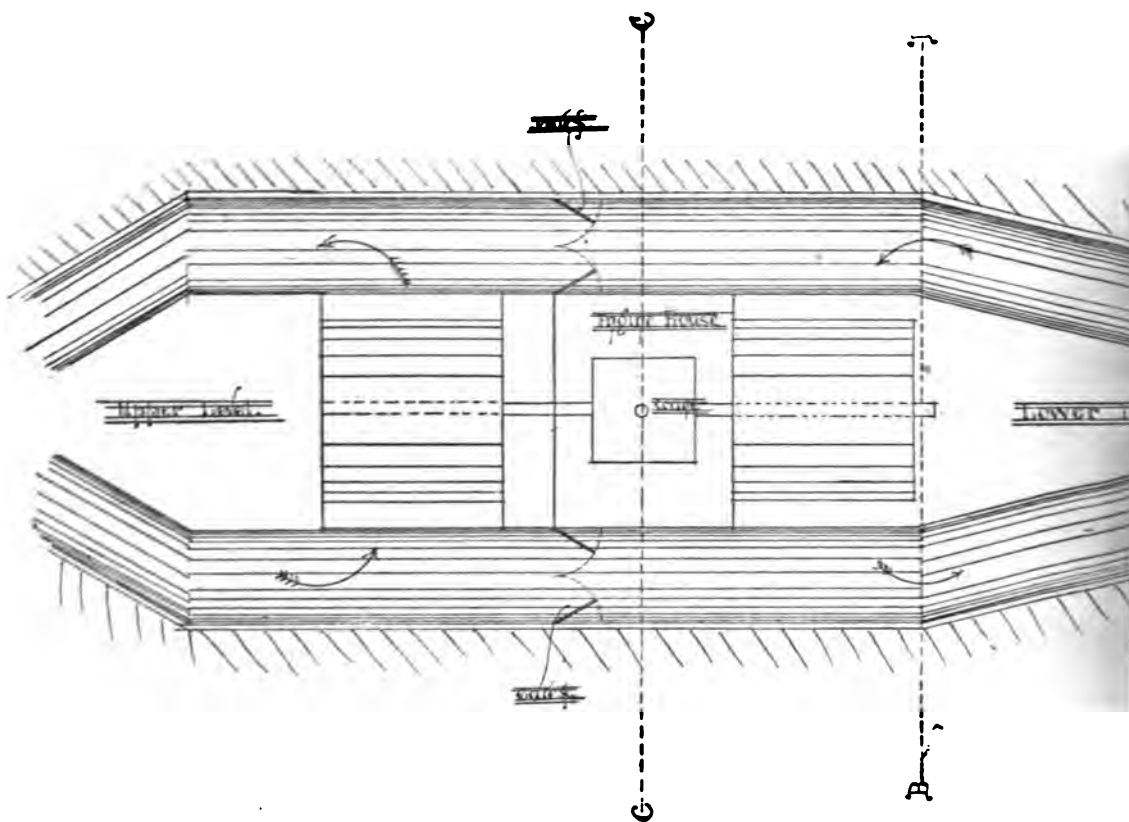
box doors and allowing of an easy tip in, from which it is forced by the propelling screw through a central tube into the body of incandescent fuel on the circular grate, consisting, as shown, of concentric cast-iron rings with air spaces between them. The grate is inclined towards the bridge at an angle, and rotates about its axis at a speed proportional to the amount of fuel it is desired to consume per square foot of surface. A supplementary grate is fitted beyond the circular one, to receive and automatically discharge the clinker which is continuously delivered to it by the circular grate.

The inclination given to the grate directs the radiant heat of the fire towards the plate-heating surface of the boiler, and also promotes the uniform and constant distribution of the fuel, which tends to fall towards the lower level, and is gradually elevated

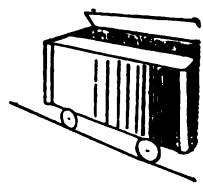
become strongly heated, and meeting with the streams of atmospheric air also being forced through the incandescent fuel on the grate, ignite, producing brilliant flame. The residue or coke is burned on the grate and forms the incandescent fuel which makes the process constant and regular so long as the furnace is at work, and coal and air are supplied in due proportions.

It will be seen from the drawings, which are self-explanatory, it is only necessary, should anything happen to the feed-screw or other part of the mechanism, to unship the hopper, when firing may be conducted on the ordinary hand system, the furnace doors, when the hopper is removed, being left entirely free for that purpose. It will further be seen that for purposes of examination or repairs the whole of the circular grate may be swung on the ball and socket

# Detail Drawings Of Canal.

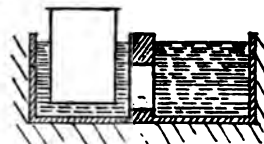
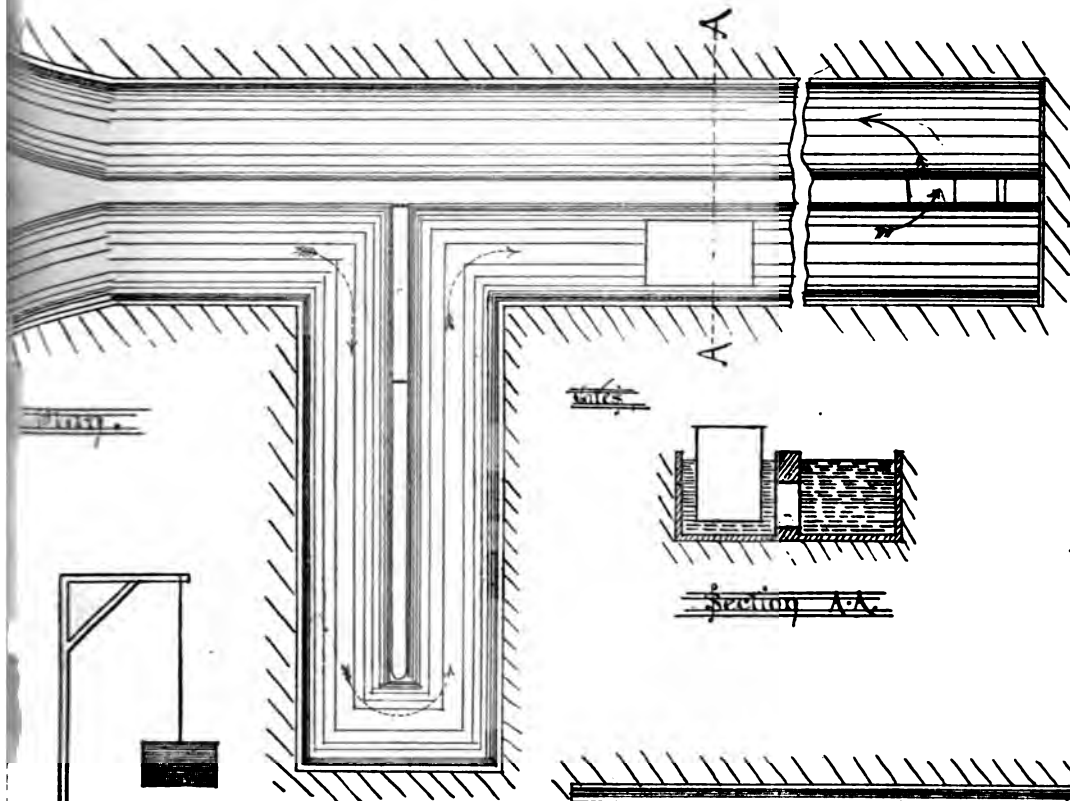


Section B.B.

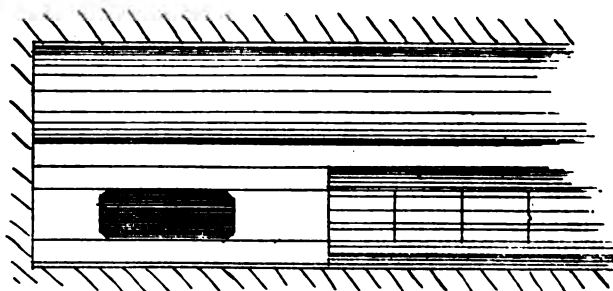




Scale Of Feet.



Section A-A.



Plan.



Side.

Engine House.

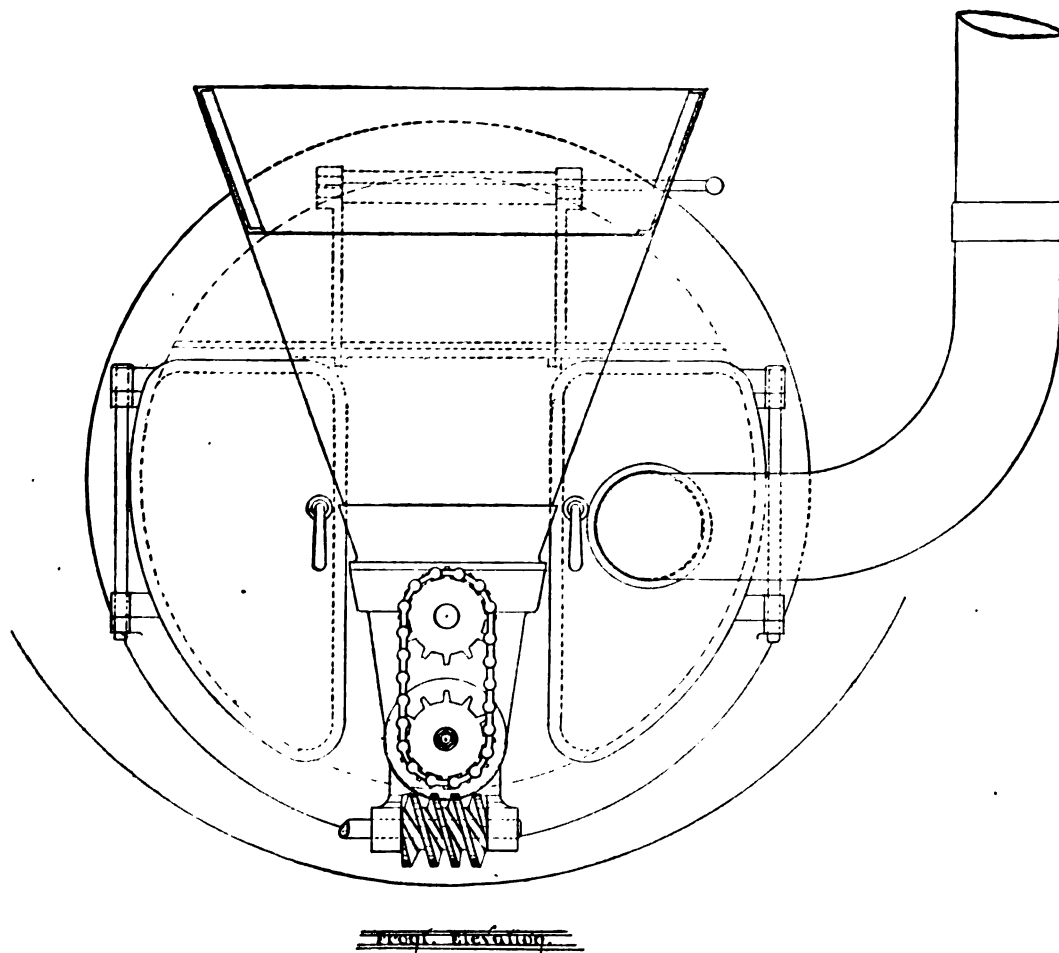
Boiler House.

Iron Co.

joint formed about the top of the central feed tube. The power required to drive a furnace is very small indeed, owing to the slow rotation of the grate, while the only labour necessary is to keep the hopper charged with fuel, thus allowing skilled stokers to be dispensed with. From this necessarily brief description it is obvious that, though the Hopcraft furnace will exhibit its greatest economy when burning "slack," it is equally capable of dealing satisfactorily with large coal—which always contains a considerable proportion of small—as compared with the present method of hand stoking. The small coal becomes with this apparatus

per square foot of grate per hour may be burnt with almost equal advantage. Coupled to this, no stoking tools are required when the furnace is at work, consequently there is no damaging inrush of cold air as in the old system, and no dust or partially-consumed carbon is emitted from the chimney top, frequently a very serious annoyance, especially on passenger vessels and men-of-war. The compactness of the furnace is fully shown in the drawings and, in fact, even the most limited stokehold can be fitted without difficulty.

As applied at Sir Joseph Causton & Sons' works, the "Hopcraft" furnaces show a clear saving of over 50



THE HOPCRAFT PATENT FURNACE.

as valuable for steam raising as the large, thus raising the efficiency of the whole; whilst it is evident that on ships of war, burning the rich semi-bituminous and smoke-making Welsh coal, the absolute smokelessness and economy of this furnace is simply invaluable, enhancing as it does the time value of the bunker load and so giving a wider radius of action. In addition to enabling the cheapest form of fuel (*i.e.*, "slack") to be used, this furnace allows a remarkable latitude in the rate of combustion, without any loss in evaporative efficiency, which becomes so serious a matter on an attempt being made to obtain extra duty from the boiler when the fuel is burned in the ordinary way. With the "Hopcraft" grate 10 to 40 or even 50 lb.

per cent. in the coal bill, while similarly as fitted on the *Lotus*, they conclusively prove that "slack" can be burned without smoke, and at a saving of from 40 to 50 per cent., the engines indicating the same horse-power as when best Welsh coal was used, under the continuous action of a steam blast in the funnel.

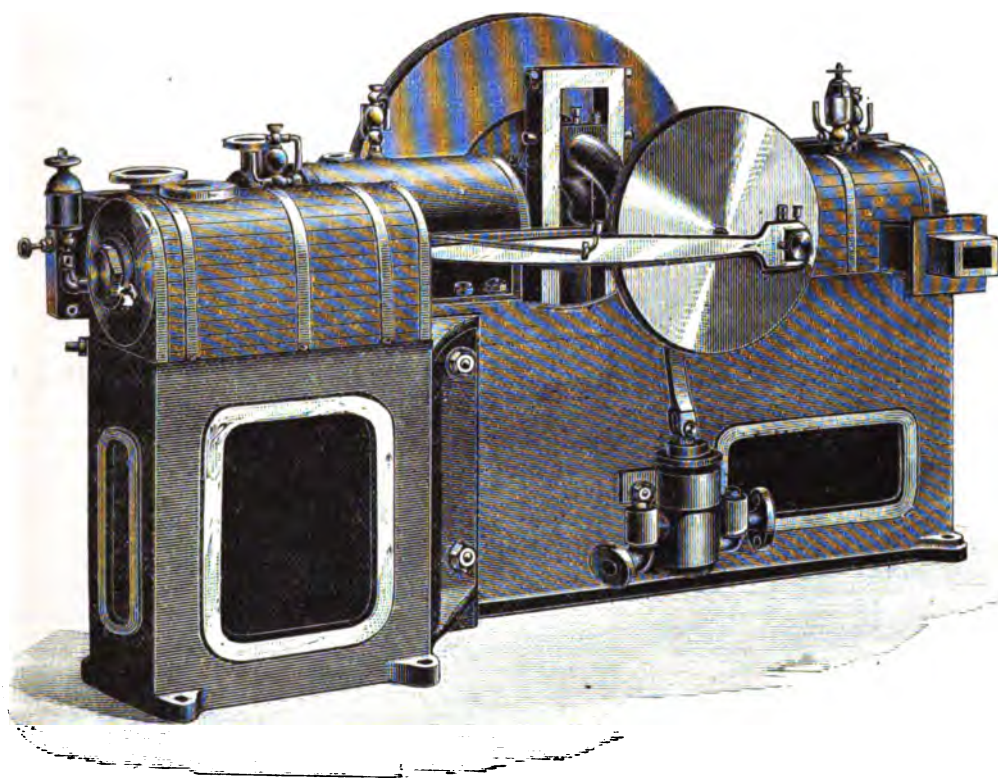
As tested by the National Smoke Abatement Institution, this grate evaporated as much water per hour with Welsh dust, with an economy of 50 per cent. in cost, compared with an ordinary furnace using hard steam coal; and 13 per cent. more water with 48 per cent. economy when using Durham slack. These facts are fully borne out by the interesting and elaborate

report prepared by Mr. D. K. Clark, and published by the Hopcraft Furnace Co. in their pamphlet, which we advise all readers interested in the subject to write for.

### STEVENSON'S REFRIGERATING MACHINE.

SINCE the successful application, in the year 1879, of the Bell-Coleman refrigerating apparatus to the Anchor Line Steamship *Circassia*, the trade in the conveyance of fresh meat and other perishable produce has made enormous strides; and numerous other machines for the production of artificial cold have been invented and brought into practical use.

sized machines, and face each other, their pistons being coupled by T-headed rods, which form vertical guide bars between which a motion block driven by the crank shaft slides, thus imparting the necessary reciprocating movement. The motion block is actuated by a sweep crank shaft, carried in bearings at each side, and having at one end a small fly-wheel, and on the other a disc-crank, driven by the steam-engine, or, where power is available, the disc-crank may be replaced by a fast and loose driving pulleys. The air compressor has an internal liner of manganese bronze surrounded by the circulating water, which thus carries away a considerable amount of the heat of compression. The air is further reduced in temperature by being passed through a brass tubular cooler, contained in the base of the machine. A pump shown



The dry, cold air machine, forming the subject of our illustration, has been lately introduced by Messrs. Stevenson & Co., of Preston; and its compactness, lightness, and simplicity of construction will meet with the approval of marine engineers, more especially for use on passenger steamers and small fish-carrying vessels. Like all similar apparatus, the principle on which this machine works is that of the compression and subsequent expansion of atmospheric air, but in its details several entirely novel and highly efficient features have been introduced. The machine works horizontally and comprises an air compression cylinder, an air expansion cylinder, and a steam-engine (when extraneous driving power is not available), coupled together on a single crank shaft. The compression and expansion cylinders are single-acting, in the smaller-

below the disc-crank circulates the cooling water; and as the air and water travel in opposite directions, the required refrigeration is obtained with the least possible quantity of water. All the valves of the apparatus are designed to work with precision, and as little friction as possible, and the ports are so arranged that it is impossible for them to block up. All the working parts are adjustable and the general arrangement is so simple that no skilled attendance is necessary.

A machine of the type shown in the illustration, weighing 2 tons, requiring 6 H.P. for driving, and about 100 gallons of cooling water per hour, is capable of keeping cool a chamber of 3,000 cubic feet capacity in temperate regions, or one of 1,500 cubic feet in the tropics.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty, from February 23rd to March 23rd, 1889.

Allen, Henry J., assistant engineer to the *Duncan*, additional, to date March 1st, and the *Northampton*, to date April 1st.  
 Barrett, Richard H., staff engineer to the *Northampton*, additional, for Sheerness Dockyard.  
 Bartwell, C. W. P. S., probationary assistant engineer to the *Devastation*, to date February 26th.  
 Bath, George C., engineer to the *Neptune*, to date March 22nd.  
 Bond, Edmund E., acting assistant engineer to the *Comus*, to date March 1st.  
 Dart, Frederick H., engineer to the *Invincible*, to date March 22nd.  
 Ellis, Matthew W., engineer to the *Comus*, to date March 1st.  
 Glanville, William G., assistant engineer to the *Fearless*, to date February 26th.  
 Harding, Charles A., engineer to the *Hibernia*, additional, to date February 26th.  
 Harrup, Thomas H., engineer to the *Triton*, to date February 26th.  
 Hatchie, David, (acting) assistant engineer to the *Comus*, to date March 1st.  
 Hearson, Hugh E., assistant engineer to the *Asia*, additional, to date March 22nd.  
 Laughton, Charles, assistant engineer to the *Emerald*, to date March 1st.  
 Lawton, William R., probationary assistant engineer to the *Bellerophon*, additional, to date March 1st.  
 Littlejohns, W. J., fleet engineer to the *Northampton*, additional for Sheerness Dockyard, to date April 1st.  
 Marrack, Philip, engineer to the *Indus*, additional, to date March 12th.  
 Murphy, Edward J., assistant engineer to the *Forth*, to date March 23rd.  
 Oram, Henry J., chief engineer to the *President*, additional, for service at the Admiralty, re-appointed on promotion, to date March 1st.  
 Pedrick, John R. J., engineer to the *Pigeon*, to date March 12th.  
 Rock, Samuel J., staff engineer to the *Galatea*, to date March 12th.  
 Ryder, John F., chief engineer to the *Cyclops*, to date March 12th.  
 Serle, Richard T., chief engineer to the *Emerald*, undated.  
 Shoobread, Adam, staff engineer to the *Duncan*, additional, to date March 1st; for the *Northampton*, to date April 1st.  
 Sparks, Henry P., assistant engineer to the *Himalaya*, to date March 7th.  
 Watch, John S., engineer to the *Bellerophon*, additional, for Halifax Dockyard, undated.  
 Wiggins, William T., engineer to the *Lapwing*, to date March 23rd.  
 Williams, Thomas, chief engineer to the *Kingfisher*, to date March 1st.

### HOAR & BROWN'S HARDWOOD MARKET REPORT, April, 1889.

TEAK.—The deliveries continue to be good, and for the four weeks ending the 22nd March, were 1,517 loads against 1,139 loads last month.

For the three months of this year 3,345 loads left the docks, against 4,808 loads in 1888, and 2,369 loads in 1887.

The stock is still being considerably reduced, and on the 1st March stood as follows:—

	Logs.		Planks.	
Moulmein ..	3,643 loads.		525 loads.	
Rangoon ..	1,353 "		351 "	
Bangkok ..	342 "		217 "	
Totals ..	5,338 loads.		1,093 loads—	
Against, in 1888:—			In 1887:—	
	Logs.	Planks.	Logs.	Planks.
Moulmein ..	6,419 loads.	341 loads.	7,478 loads.	655 loads.
Rangoon ..	984 "	25 "	1,922 "	203 "
Bangkok ..	800 "	100 "	2,972 "	768 "
Totals	8,203 loads.	466 loads.	12,372 loads.	1,626 loads.

The market remains firm, with prospects of a further steady rise.

Cargoes are scarce and are firmly held.

GREENHEART.—The stock is very small, viz.:—207 loads, against 1,285 loads in 1888. The deliveries for the last four weeks have been 49 loads.

MAHOGANY.—The market here still remains flat, although much better prices are being obtained at other ports. The large consignments which have arrived in London within a short time appear to have caused a certain amount of fear among buyers, who are holding off for future sales, under the impression that prices will fall; and unless the sellers place a certain reserve upon their transactions, there will surely be a decline for a short period.

CEDAR.—The stocks are very short indeed, and prices have risen considerably.

AMERICAN WALNUT.—Considerable trade has been done in logs at the old prices, and the imported board and plank business has not fallen off. Medium quality parcels are required.

WHITEWOOD.—Logs are depressed, but boards and planks are doing well. Some prime parcels of 1-in. unplanned have been imported, with the good feature of being cut on the quarter. Some considerable shipments have also arrived of planed stocks of varied qualities.

SEQUOIA.—A fair amount of business is reported at rather increased values.

SATIN WALNUT has decidedly improved, and little now remains in first hands.

Business has been reported only fairly good during the first half of the month, with a gradual falling off, up to date, but better and more active times are looked for during April.

### R. E. MOSS & CO'S STEAMSHIP CIRCULAR.

SINCE the date of our last Steamship Circular, September 29th, 1888, prices for building and of second-hand vessels have advanced considerably; for a short time there was a lull, but before December many shipowners awoke to the fact that wages were rapidly advancing, and this, coupled with a general advance in price of materials, plainly showed intending buyers the necessity of placing their orders quickly, and several contracts were made probably at 7½ to 10 per cent. lower than they could be placed just now. Since September a number of the rather numerous *spec* boats then on hand have been cleared off, and as a rule at a profit to the fortunate speculators of 15 to 25 per cent., and in one instance including the profit on a voyage of nearly 40 per cent. Coupling with these facts the balance sheets of several of the single-owned ships, showing 30 per cent. to 45 per cent., it cannot be wondered at that managers of these vessels have replaced any wrecked or lost vessels by boats in construction, and paid heavy premiums in preference to giving out orders to builders, and accepting delivery late in the autumn or early in 1890. The almost absolute certainty that the Government will give out very heavy orders for armed cruisers at an early date is making many leading shipbuilders and engineers very chary of giving quotations, and when they do it is at a marked advance. Taking matters all round, we consider the prospects of shipbuilders for the next twelve months are exceptionally good, also that shipowners may fairly expect that freights all round will continue remunerative, and show a very handsome return on the capital invested.

We call attention to a matter in which the British Steamship owner is seriously handicapped. A well-decked screw-steamer, 100\* A 1 630/400 register, built in 1885, had frequently carried deadweight cargoes of the most valuable description of 650/700 tons, always delivering the same in perfect order, and never claiming from underwriters since she was built, was, last August, stopped by the Board of Trade, who required the vessel to have a clear side of 17½ in., the depth of hold being 13.2; this gave the vessel a deadweight capacity of 594 tons. The owners immediately decided it would not pay them to work her, and negotiated her sale to a foreign firm at a greatly reduced price,

and they are now able to send her to English ports carrying 700/720 tons, the additional freight earned paying them a handsome profit on their purchase. *This should not be*; foreign-owned steamers bringing cargoes into English ports should be subject to the same Board of Trade regulations as English-owned vessels, or some other arrangements, for a fair equivalent, should be made.

One very marked feature in the present tonnage that is building is the increased size, and another is the decided preference given to steel. During the past year comparatively few iron vessels were built, though it is but fair to say that some owners are somewhat changing their opinion, and are trying iron once more. The various shipbuilding yards abroad are full of orders for nearly the next twelve months, and any foreign buyer requiring earlier delivery must come here. We have very elaborate statistics prepared, but find they would trench too heavily on the space at our disposal. We therefore briefly state that the total tonnage under construction in December, 1888, was 364 steam ships, 730,000 tons; and 81 sailers, 82,000 tons; and of these a tonnage of 326,413 was commenced between September and December. In December, 1887, there were 209 steamships, 397,525 tons, and 70 sailers, 41,800 tons, showing an increase in 1888 over 1887 of 330,000 tons s.s., and 39,852 tons of sailers.

As Ocean Carriers we still retain our proud pre-eminence, and the percentage of tonnage carried in British bottoms shows in 1888 a considerable increase over previous years.

## INDUSTRIAL AND TRADE NOTES.

### THE CLYDE AND SCOTLAND.

THE proportion of fresh contracts booked by Clyde shipbuilders and engineers to those completed, has been relatively much smaller during the past two months than in the months immediately preceding, but the various firms, notwithstanding, continue to keep their workmen busily employed. The London and Glasgow Shipbuilding and Engineering Co. have secured the contract to construct two twin-screw steamers, 265 ft. long, 36 ft. broad, and 22 ft. 6 in. deep, and about 3,000 tons each. They will be supplied with triple-expansion engines. These vessels are for Messrs. Swire & Sons, London, and are intended for the China coasting trade.

Messrs. Robert Napier & Sons, Govan, have contracted to build another steel screw steamer for the Royal Mail Steam Packet Co. similar to the *Otrato*, completed at the end of the year for the same company. This is the fourth vessel ordered recently for the company from Messrs. Napier, only one of which, the *Otrato*, has been finished. The vessels are of 6,000 tons each.

Messrs. Barclay, Curle & Co., Whiteinch, secured, about the middle of March, the order to build for the China Shippers' Mutual Steam Navigation Co., a steel screw steamer of about 3,300 tons for the China trade. This steamer will be similar to, but 30 ft. longer than, the *Oanfa*, built for the same company last year, by Messrs. Aitken & Mansel, Whiteinch.

Messrs. Mackie & Thomson, the new shipbuilding firm at Govan, contracted for two additional steamers during March. Altogether eleven steamers have been booked by this firm since starting business about six months ago.

Messrs. Swan & Co., whose yard is on the Forth and Clyde canal bank at Maryhill, have lately laid down the keel of a new iron screw steamer. They have another screw steamer to commence to, and are at present negotiating for a third.

The Union Steamship Co., of New Zealand, have lately arranged with Messrs. Denny & Bros., of Dumbarton—who built all the company's vessels—for the construction of two new, swift, powerful, and fully-equipped mail and passenger steamers for service between San Francisco and the New Zealand ports. The present contract has been entered into with the view of providing for the increased traffic likely to be promoted by the great Exhibition to be held at the Antipodes next year.

Owing, it is said, to the likelihood of wages disturbances with their employes, a Clyde shipbuilding firm, who have built largely for an Amsterdam shipping co., have lately had to refuse to build two large passenger steamers. The order for the vessels has now been placed with a firm in Holland.

The great difficulties which Clyde shipbuilders have had to

contend with all through the present period of briskness, in the matter of slow delivery of material and repeated wages demands, have not been lessened by the announcement of the Admiralty scheme for the extension of the Navy, and the implied pledge that the Clyde as well as other private shipyards would be requested to execute the new work. The feeling is very prevalent amongst shipbuilding and engineering firms that naval extension would have been much more welcome at a time when merchant shipbuilding was less brisk than it is at present. The prospect opened up by the projected scheme is very much clouded by the consciousness that the first effects will inevitably take the form of inordinate advances in the prices of material, and of increased wages demands on the part of operatives.

The prices of steel have already been considerably advanced since the great addition to the Navy began to be talked about. The lead was taken by the Steel Co. of Scotland, and the other Scotch makers followed suit. Boiler plates at the present writing are quoted at £8 7s. 6d. per ton: a rise of 10s. in a week or so; ship plates at £7 12s. 6d., a rise of 2s. 6d.; and ships' angles at £6 12s. 6d., a rise of 2s. 6d. While trade was quiet Scotch pig-iron stood steadily at 40s. to 42s., now it is quoted at 56s., showing an increase of about 35 per cent. Manufactured plates, angles and bars, in little over 12 months' time, have all risen 30 per cent. at least; and rivets, owing to the makers' combination, have been advanced as much as 45 per cent.

With respect to labour: the attitude of the ship fitters and rivetters is one persistent demand for higher rates of wages. At the present time the rates paid to piecework ship fitters are about 40 per cent. in advance of what they were 12 months' ago, frame setters about 35 per cent., and rivetters about 35 per cent.; strikes have been and continue to be the order of the day amongst the "black squad," and very often the most insignificant circumstance is made a pretext for dropping work and urging demands. It is, of course, only right that workmen should sell their labour as advantageously as possible, but the class of workmen referred to as the "black squad" have been pressing matters most irrationally and selfishly. Time-workers, and those of a class superior in every respect to platers, rivetters, &c., such as carpenters, joiners, engineers, and blacksmiths, have been singularly quiet during the brisk period, and have worked on steadily with every appearance of contentment, although their wages now on the average are scarcely more than one farthing an hour in advance of what they were a year ago.

Commenting on this state of matters, a Glasgow daily journal says:—"To allow ironworkers, or what is generally known as the 'black squad,' to run up an increase on last year's rates of from 35 to 40 per cent., while intelligent artisans, engineers, blacksmiths, carpenters and joiners are rewarded with an advance of 5 per cent., is so glaringly unjust that masters should themselves see to its adjustment. For ironworkers to insist on further demands, or threaten strikes in the face of such advances as this, is suicidal and foolish, and can only end in general disaster to both masters and men by driving prospective orders to other rivers where a policy more sane and logical is in force."

Boilermakers, like shipbuilders, continue to experience difficulty in obtaining delivery of plates, and this is in some cases causing serious detention in the fulfilment of contracts. Engineers, too, have their own difficulties to contend with in the slow delivery of heavy castings from the works of the foundries. Failures in castings have been very plentiful since the period of briskness set in. Several firms of foundries have lost heavily in this way, one firm having had as many as six unsuccessful castings in as many months for one engineering firm alone. The work of the founder is at all times a very ticklish and uncertain affair, but it is believed that the abnormal number of failures which have recently taken place is largely to be accounted for from the facts of the great pressure of work and the independence and carelessness such a state of matters is apt to engender in the moulders or their foremen.

Greenock is bestirring itself to carry out a long-standing intention of erecting a public monument to its celebrated townsman, James Watt. The name of Watt is already, in several ways, commemorated in Greenock; for example, there is the Watt Institute, founded by Watt himself, which contains a marble statue, by Chantrey, of the great engineer, the gift to the Institute of his son; and there is also the large wet dock—Greenock's great "white elephant"—which bears the name of

Watt. It seems, however, that the Greenock folks have come to the conclusion that some more direct mode of doing lasting homage to their celebrated townsman is wanted. A design for a monument has been prepared, showing the celebrated engineer standing erect, with his left hand resting on the model of a steam-engine, the estimated cost of which is the pitifully small sum of £1,200! Notwithstanding the unambitious nature of the scheme there seems at present less readiness to subscribe to the fund than to discuss the eligibility of various sites for the monument. A proposal that it should occupy a prominent situation on the magnificent esplanade of Greenock, in full view of the Firth, appears to commend itself most. This would undoubtedly be an appropriate site, and when once fixed on, Greenockians might safely look to outside subscribers with assurance of support sufficient to warrant them in aiming not only at £1,200, but at three times that amount, as the cost of an appropriate monument. While schemes for erecting commemorative objects to early engineers like Watt and William Symington meet with but indifferent encouragement, a proposal to erect some fitting memorial of the late William Denny, shipbuilder, of Dumbarton, has been meeting with prompt and tangible support. At the present time the fund amounts to £5,500. It has not yet been decided what form the memorial will take, but it is thought an Institute of some kind, devoted to education and recreation, will best perpetuate the deceased gentleman's own spirit and aims while in life.

In accordance with the terms of a report which Captain Deverell, R.N., has presented to the Executive Committee of the Clyde Industrial Training-ship Association regarding H.M.S. *Pembroke*, presently the flag-ship at Chatham, that committee have notified to the Admiralty that the *Pembroke* is suitable for the purpose of replacing the Association's Training Ship *Cumberland*, recently destroyed by fire, through the incendiary act of some of the boys on board. Like the *Cumberland*, the *Pembroke* is a wooden ship, but she is rather larger, being 2,842 tons burthen, and is, moreover, of a more modern type, having been launched about 1855.

Considerable interest was evinced by people in Glasgow and along both banks of the Clyde, about the middle of March, in the passage of the magnificent new Inman Liner, *City of Paris*, from Messrs. Thomson's establishment, at Clydebank, to the Clyde Trust's graving dock, at Govan. The appearance of the huge vessel excited universal admiration, and her presence in the graving dock was rendered additionally noteworthy by the fact that, at the same time, the second of the Trust's graving docks was occupied by one of the largest cargo-carrying steamers afloat—the s.s. *Belgravia*, of the Anchor Line. The *City of Paris* left the Clyde for Liverpool on the 21st March.

Messrs. Kelso & Co., the noted mechanics and model-makers of Commerce Street, Glasgow, have recently completed apparatus of a very special kind to the order of the Italian Government. This is the carriage and delicately-adjusted dynamometric apparatus for recording the resistance of ships' models when being towed through the water of an experimental tank, such as is established at Gosport by our Admiralty, and at the private shipyard of Messrs. Denny Bros., Dumbarton. The carriage and recording apparatus is destined for the new experimental tank, which the Italian Government are forming at Spezzia. The tank which is 500 ft. in length by about 22 ft. in breadth, is to be fully equipped with all the special and highly ingenious instruments and appliances which the scientific skill of the late Dr. William Froude, of Torquay, brought into existence, and which have been subsequently improved, in actual practice, by Dr. Froude's son, Mr. R. E. Froude, and by the staff of experts employed by Messrs. Denny. Through the courtesy of our own Admiralty and of the Messrs. Denny, the commissioner acting for the Italian Government in this matter, and Messrs. Kelso & Co. have been permitted to avail themselves of the latest improvements which their experience has suggested.

Thanks, too, to the exceptional skill of Messrs. Kelso—who were also the makers of the apparatus in use by Messrs. Denny—the Italian Government are now in possession of a most perfect apparatus for engaging in those resistance and speed experiments which have again and again been shown to be of such practical utility to the naval designers of this country.

INSTITUTION OF NAVAL ARCHITECTS.—The Annual Meetings of the Institution will take place on Wednesday, April 10th, and the two following days, at the Hall of the Society of Arts, John Street, Adelphi, London, W.C.

## TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

**The Tyne.**—In the shipbuilding industry the state of building is, from the point of view of the outside public, everything that could be desired. That is to say, there is an abundance of work in the yards, with a consequent heavy wages payment weekly, a condition of matters which, of course, reacts favourably upon the business interests of local tradespeople. With the shipbuilder, however, the case is somewhat different, for though there is no lack of orders, the keen rivalry of different districts has kept down prices to a point which is barely remunerative, and it is only by very close attention to matters of detail, as well as by general circumspection in the management, that shipbuilders are enabled to steer clear of loss. There are other sources of trouble which, viewed from the shipbuilders' standpoint, are calculated to largely minimise the advantages of brisk trade. These are:—the difficulty of procuring necessary supplies of material from the manufacturers, and the scarcity of labour, especially of the skilled kind. These causes combined are, at several yards, seriously hindering the progress of operations, and will possibly, in some instances, prevent the fulfilment of contracts by the specified dates. The wages question is now settled for a period, with all sections of workmen, on the basis of a 5 per cent. advantage all round. The pressure of work at the yards of the three principal firms, viz., Messrs. Armstrong, Mitchell & Co., Messrs. Palmer & Co., and Messrs. Hawthorn, Leslie & Co., is, if any thing, greater than ever. The first named have no less than 16 vessels (half of these being cruisers), representing an aggregate tonnage of about 40,000 tons, in course of construction; and Messrs. Palmer have a dozen vessels in progress, the united tonnage of which will not fall far short of 30,000 tons. Messrs. Hawthorn & Leslie have not so many available building berths as either of the other two great firms mentioned, and they have consequently less work in progress, but the vessels are all of a very superior class, two of them having been ordered by the Admiralty for special service in connection with the national defence. Messrs. C. S. Swan & Hunter are actively developing the resources of their "east" yard, which has stood idle for some years. Two of the berths are already occupied with vessels, and it is said to be the intention of the firm to put down, in all, four vessels in this division of their establishment. Should this be the case, the effect of the extension will be to double the productive capacity. A similar process of extension is being carried out at other establishments, and it is evident that in the race of competition, and especially as regards the matter of output, the Tyne is every day coming on more even terms with its more Northern rival, the Clyde. Messrs. R. Stephenson & Co., Hebburn, have ordered a number of new punching and shearing machines, with a view to further facilitate production in both the shipyard and the boilerships. They have not, up to the present, utilised to as full an extent as they might have done, the resources of their very large establishment, but it is understood that this order of things is now likely to be changed, and that when the new plant now ordered is put down, the yard is likely to be worked to its very fullest capacity. The Tyne Shipbuilding Co. continue to be very busily engaged, the vessels on the stocks being, for the most part, of exceptionally large tonnage. The other Tyneside yards, including those at Shields, where only vessels of a small class are usually built, continue to have a good show of work on their stocks. Among the repairing firms, Messrs. Edwards & Sons, of Tyne Dock, hold a leading place, and they have now several large steamers undergoing repair in their graving docks. The Wallsend Slipway and Engineering Co. have executed some important repair contracts since the opening of the year, and they are not likely to experience any lack of work in this department for many months to come. The Tyne Commercial Dry Dock Co. are making satisfactory progress with the construction of their graving dock at Jarrow, but it is a large undertaking, and there is little prospect of its entering into competition with the other docks of the district during the present period of briskness.

**Engineering.**—The extraordinary activity which has characterised Messrs. Hawthorn, Leslie & Co.'s works at Farth Banks and St. Peter's for more than a year is still fully maintained, and great as are the productive facilities possessed by the firm, they continue to find it necessary to lay under contribution the resources of neighbouring establishments

for the execution of subsidiary portions of contracts. Business at the other marine engine works continues very active, and in all cases the system of working double shift is kept up. Messrs. Emerson, Walker, & Thompson Brothers have now got the new building, which is to form an extension of their fitting shop, completed, and they will, as a consequence, be enabled to largely increase their output of heavy ships' windlasses, steam winches, &c. Independently of orders for windlasses to be supplied to first-class steamers now in course of building, the firm have orders for several powerful accessories of the same description for use on vessels now trading in different parts of the world. Messrs. Carrick & Wardale, of the Redheugh Engine Works, are receiving frequent inquiries from new sources, in respect of their specialities in pumps for use on shipboard and other purposes, and their chief difficulty is the importunity of inquirers for early delivery. Being a firm, however, which has long held an honourable position in this department of the engineering trade, they have an established connection of a very extensive kind, and the requirements of their regular customers are just now large enough to almost wholly monopolise the productive resources of their establishment. Messrs. Donkin & Nichol, of the St. Andrew's Engine Works, having made some important additions to their plant, are now considerably increasing their output of hand and steam steering gears, ash hoists, and other specialities. The firm are working night and day in all departments. At Messrs. John Abbot & Co.'s works and Messrs. Black, Hawthorn & Co.'s, the orders in hand are very numerous, and all departments keep busy. In the anchor department of the former establishment, where special plant has been put down for the manufacture of Tyzack's patent stockless anchors, quite exceptional activity is maintained. The St. John's Leather and India-rubber Works (Messrs. George Angus & Co., Limited) are kept exceedingly busy, the demand for the firm's various engineering specialities being unusually good. Forge works are generally very much pressed with orders, but there is in connection with this branch a scarcity of skilled operatives, as is shown by the frequent advertisements for frame smiths and other operatives that are continually appearing in the local papers. A Labourers' Union—a trade union having for its main object the organisation of unskilled labour—has just been started on the Tyne. The men who have joined it are principally shipyard labourers. A union existed among this class some years ago, but it went to wreck under the pressure of "hard times" and other adverse influences. As union, both among employers and workmen is the order of the day, the formation of a union amongst this class may be an advantage, especially if it is wisely and temperately conducted.

**The Wear.**—In the early part of the month the very unfavourable weather which prevailed was a serious hindrance to the progress of operations in the shipyards, and some launches, which would otherwise have taken place, had to be postponed in consequence. A strike among the platers' helpers was an additional hindrance to business, but this came to an end on the second or third day of the month, the men having decided to accept an offer made to them by the employers some ten days before. This offer involved the concession of a small advance, which brought the wages for outside helpers up to 29s. per week, and for furnace helpers to 30s. 6d. per week. Other wages claims which were put forward in the course of last month have since been settled through the medium of the Conciliation Board. Some months ago Messrs. J. L. Thompson & Sons commenced the erection of extensive new sheds, gas furnaces, &c., on a piece of ground acquired by them for the purpose, in proximity to the eastern boundary of their yard. This addition was made with the view of providing better facilities for carrying on the earlier stages of constructive work, and at the same time of affording valuable space for the more complete development of other departments. The work is now completed, and the structure forms a most suitable adjunct to a shipbuilding establishment which was already one of the largest and most perfectly-appointed in the kingdom. The firm have some heavy repair contracts in hand, which they are carrying out at their branch establishment, Manors Quay, and at the Wear Commissioners' graving docks. Messrs. R. Thompson & Sons have also completed the important works of extension they have had some time in hand, and have got their newly-acquired hydraulic plant in working order. Messrs. Short Bros. have just completed a very extensive overhaul of the s.s. *Soldier Prince*. The firm have their building berths fully occupied. The largest steamer yet built on the Wear is now rapidly approaching completion at the Deptford yard, and

will soon be ready for launching. There are a couple of other good-sized vessels also in advanced stages, and the frame-bending department is kept briskly going. There is nothing special to note in connection with the progress of work at any of the other establishments, but all of them, it may be stated, continue busy.

**Engine Works.**—At the Palmer's Hill Engine Works, orders for Dickinson's patent crank shaft are more numerous than at any former time, and it has been found necessary to put down new machinery in the department of the works where this speciality is produced. The number of contracts for marine engines at this establishment is also unprecedentedly large, and throughout the whole of the shops the utmost activity exists. At the North-Eastern Engine Works, as also at Messrs. Clarks', and Messrs. Doxfords' establishments, a state of general activity is still to be noted. The s.s. *Meath* will shortly be placed beside the jetty at the Scotia Engine Works to receive the new cylinders and other sectional parts, which have been manufactured at the works and have been some time in readiness. These additions to the vessel's engines will constitute a conversion from the compound surface condensing type to the new quadruple design of Mr. William Allan, and the carrying out of this contract will afford the first opportunity for fairly testing the merits of the new type. New boilers have also been manufactured for the vessel at the Scotia Works, and in their construction it may be stated that every possible care has been taken to secure uniform strength throughout. In the smaller engineering establishments business is generally pretty active. The Pier Engine Works, South Dock, are kept steadily going with repair contracts, and the manufacturers of Smith & Stephen's interchangeable chain wheel are having an increased demand for their speciality. Steam winch makers continue to have their resources severely taxed to meet the large demand for their productions, and the manufacturers of other descriptions of steam-ships' accessories are equally busy. Mr. A. A. Rickaby, of the Bloomfield Engine Works, is plentifully supplied with orders in the special lines for which he has achieved a deservedly high reputation, and his well-appointed factory was never busier than at this moment. The Portobello Foundry, which was considerably extended a few months ago, is literally full of work, and it is only by keeping the hands employed for a good many extra hours each week that contracts can be fulfilled with any approach to punctuality. Orders for ships' keels, stern frames, rudders, and engine shafting, are still very plentiful at the forges, and both rivet works and chain works continue to be well employed. The hemp and wire rope works of Messrs. Craven & Speeding have largely participated in the trade improvement which is now general throughout the district, and the weekly output at their large factory is exceptionally heavy. Other rope works in the district are also kept busily going. Saw-mills are much busier than they were in the closing months of last year, and boat builders who, up till recently, had very little to do, are now getting a fair share of work. In the local coal trade business is very active, and throughout the whole of Durham the collieries are working well. Taking advantage of the improved condition of the industry, the miners are beginning to agitate for a considerable advance of wages, but it is probable that the matter will be settled without recourse to the unpleasant methods by which, in former days, such matters had too often to be decided.

**The Hartlepoons.**—The shipbuilding industry at the Hartlepoons continues very active, and the great resources of Messrs. W. Gray & Co.'s establishments are being utilised to the utmost to meet the exigencies of the situation. Messrs. Withey & Co. are making arrangements to increase their productive capacity by the laying out of an additional building berth, and they are in other important particulars improving their facilities for carrying on work. The Central Marine Engine Works are fully employed, and it is gratifying to hear that recent advances in wages which have been granted to all departments are regarded as satisfactory by the men, so that there is every prospect of a good year's work being got through in the midst of the pleasantest relations between employers and employed. There is now under the sheers a vessel of 4,300 deadweight carrying capacity receiving her machinery, and another, of smaller size, is awaiting her turn. These large works will shortly have added to them a substantially-erected building of great size, which is to be utilised for the carrying on of heavy forging work. The building, which will be fitted up with the best modern machinery, will be ready for the commencement of operations about Midsummer. In the different departments

Messrs. Thos. Richardson & Sons' establishment continued activity is the feature. During the past month the firm have placed on board and completed the machinery of the following vessels:—

The *Wastwater*, for Messrs. Huddart, Parker & Co., Melbourne, having triple-expansion engines 24 in., 38 in., 64 in., by 8 ft. 6 in. stroke; and two steel boilers, 11 ft. 9 in. diameter, by 14 ft. 9 in., and capable of working up to 160 lb. pressure.

The *Magnus Mail*, for James Westoll, Esq., Sunderland, with triple-expansion engines 21 in., 35 in., 58 in., by 3 ft. stroke; one boiler 14 ft. diameter by 15 ft. 3 in.; working pressure 160 lb.

The *Urbino*, for Messrs. Thos. Wilson & Co., Hull, with triple-expansion engines 22 in., 35 in., 59 in., by 3 ft. 3 in. stroke; also two boilers, 13 ft. 6 in. diameter, by 9 ft. 9 in. long, and constructed for 160 lb. working pressure.

The *Hudson*, belonging to the Hudson Shipping Co., Limited, has also been tripled, and supplied with new boilers for 180 lb. working pressure.

An engine 21 in., 35 in., 58 in., by 3 ft. stroke, has also been completed and shipped to Norway to the order of the Laxevas Maskin and Jernskibs-byggeri, Bergen.

After successful trial trips the following vessels (both of which were engaged by the firm) proceeded to sea:—

The *Athena*, 11th March, owned by R. H. Penny, Esq., of Brighton.

The *Jordan*, 20th March, owned by the Mercantile Steam Shipping Co. The local steel works are kept exceedingly busy, the requirements of shipbuilders and boiler manufacturers in the district being alone sufficient to keep the furnaces and machinery in pretty constant operation. In the saw mills, business has been beneficially affected by the prosperity in the more important local industry of shipbuilding, and full time is now being pretty generally worked. In the rope works there is also considerable activity, and cement factories are kept going to their very utmost capacity. The shipping trade of the port is, as may be supposed, much more active than it was at the corresponding period of last year, and in the course of a few weeks, when the timber trade from the North Sea ports fairly opens, the activity will, of course, be greatly enhanced.

**Stockton.**—The shipbuilders at this centre have, up to the present, secured a large share of the orders that have come into the market, and the whole of the yards are now presenting an appearance of great briskness. The Carrs Shipbuilding Yard, which was opened out a very few years ago by Messrs. Craig, Taylor & Co., may be described as one of the most successful establishments in the district, rapidity of execution, combined with the general excellence of the work turned out, having already attained for its proprietors a very high position in the staple industry of the North-East Coast. An additional building berth has just been added, and it is the intention of the firm to further extend their productive capacity until space is provided for the laying down of six vessels simultaneously. The plant, which is already very extensive and effective, will be increased to a proportionate extent with the added building space, and when the whole arrangements are completed, the establishment will be capable of an exceptionally large output. Messrs. Craggs & Sons, of Middlesbro', have re-opened their Stockton yard, which was closed some four years ago, after a very limited amount of work had been done. The firm have now an iron vessel and a steel one laid down at this establishment, and it is understood that they have other orders to follow. A new manager, who comes to the firm with the very best credentials, has been appointed, and there is little doubt that, under his able guidance, the business of the establishment will be conducted in a way to secure satisfactory results. Messrs. Richardson & Duck have all their berths occupied, and the same statement applies to the yard of Messrs. E. Ropner & Co. Messrs. Blair & Co.'s Engine Works continue in full activity, and the works of Messrs. Wrightson & Head are also very busily employed. The last-named firm are now engaged in erecting a new foundry, which, when completed, will be among the largest concerns of the kind in the district, and will be admirably adapted for the economical production of the larger class of castings. Messrs. Reilly Brothers, who continue to be extremely busy, are now about to commence the erection of their new boiler works. The whole of the iron works in the district continue to be well employed.

**Middlesbro'.**—Shipbuilders at Middlesbro' continue to do an active business, not only in the construction of new steamers, but also in repair work, of which a very large share comes to the port. The annual meeting of the Tees-side Iron and Engine

Works Co., Limited (presided over by Mr. H. F. Pease, M.P.), was held on the 22nd inst. The report, which was of an encouraging character, was adopted, and the retiring directors were re-elected. The works are just now pretty fully employed, and there is a good prospect of remunerative business in the future. The other engineering works at this centre are doing well, and foundries are generally busy. The iron works are also well engaged, and the pressure of business in the steel works is undiminished. In the pig-iron trade the demand is still satisfactory, and the very considerable advance in values, which has been reached within the past few weeks, is fully maintained.

**Darlington.**—The very exceptional resources of the Darlington Forge Co. continue to be fully utilised, and forgings of the heaviest class for shipbuilding and engineering purposes are being turned out in quick succession. The company are also doing a large business in steel castings for marine work, propeller blades, hawse pipes, dredger buckets, mast caps, &c. Waggon works at this centre continue to be kept satisfactorily employed.

**Consett.**—The greatest possible activity still characterises the iron and steel works at this centre, and though the weekly output is unprecedentedly large, it is scarcely sufficient to meet the pressing requirements of customers. In accordance with an agreement entered into in April last year, between the employers and the representatives of the workmen, an ascertainment of the net selling price of steel plates at Consett during the months of December, January and February has been arrived at with the result that the wages of millmen will be advanced 2½ per cent. during the next three months. According to present appearances, another advance will probably become due at the expiration of that period.

## THE MERSEY.

AS indicating the general improvement in trade, we are pleased to chronicle, at the outset of this month's notes, the satisfactory reports of the directors of the various shipping companies having head centres in Liverpool. To begin with the working account of the National Steamship Co., including the balance of the commission account, it shows a profit for the year of £79,915; the underwriting fund, after making payments to captains and officers for safe navigation, has a credit balance, including interest, of £34,543; the depreciation fund has been credited £25,834; and as some of the company's vessels will shortly require considerable alterations and repairs, a further sum of £25,000 has been written off for this purpose, every penny of which latter sum we trust will find its way into local pockets. The West India and Pacific Steam Navigation Co.'s statement of account shows an available balance of £42,995, which, after payment thereof of a 10 per cent. dividend, leaves £10,995 to be carried forward. Unfortunately the Isle of Man Steam Packet Co.'s accounts show a balance on the wrong side, the total receipts having been £66,860 against a total disbursement of £71,129, or a loss on the year's turn over of £4,268, due to the reduced rates during the recent competition. Let us trust that the next twelve months will prove more lucrative for this popular and deserving company.

A very interesting paper on "The Construction of Small Harbours, and the Silting they give rise to," was read by Mr. G. Farran, A.M.I.C.E., at the ninth ordinary general meeting of the Liverpool Engineering Society, and gave rise to a valuable discussion in which several local celebrities joined. The emigration season has commenced a little earlier this year than usual, and from all accounts we may expect a fair increase in the number of emigrants who will leave the port this year.

During the first week of March 2,382 cattle were landed in Liverpool, and 9,383 quarters of beef, or an increase of 1,360 cattle and a decrease of 583 quarters of beef on the numbers for the previous week.

Owing to the very marked increase of the petroleum trade of this port, great preparations are being made both in Liverpool and Birkenhead to meet the increased demand for accommodation. We may mention that the five tanks already existing at Birkenhead have a capacity of 56,000 barrels, or 2½ million gallons, while the caves on the Liverpool side can accommodate 78,000 barrels. The supply of Russian oil shows an enormous increase, 152,636 barrels having been shipped in Liverpool last year; the supply of American oil is, however, decreasing.

Along with other trades, that in timber still continues to

maintain the decided improvement which set in with the year, and there is, we are glad to say, every prospect of a real good season. There is a decidedly increased general demand, and prices all round are much firmer.

There is a proposal to extend the Leasowe embankment about 1,000 yards further towards New Brighton and 1,500 yards along the Leasowe shore, towards Hoylake, and a private Bill is being promoted in Parliament with that object. As the ratepayers of the district consider that the works are only to protect private property, there is a strong feeling of opposition to the scheme, and it is doubtful whether the Bill will not be effectually opposed.

All the large shipping companies are making extensive preparations for coping with the greatly increased United States and Canadian traffic which is expected in the coming season, owing to the visitors who will flock to the Paris Exhibition.

The Mersey Docks and Harbour Board are petitioning Parliament with a view to partially abandoning the overland railway scheme and substituting a level railway scheme.

As the present system has been found to be totally inadequate to cope with the enormous development of the Mail service between this country and Canada, preliminary arrangements have been made for establishing and subsidising a new line of steamers to run between Liverpool and Canada, and between Vancouver's Island and Yokohama. The necessary Parliamentary sanction for this important scheme will, it is expected, be obtained during the present session.

### WELSH NOTES.

THE wages dispute at Morriston Tinplate Works, of Messrs. Wm. Williams & Co., continues, and so far there appears little chance of any satisfactory conclusion being come to. The men say the masters have been paying too low wages, less than was decided upon in 1874, when masters and men decided upon certain terms. The masters deny this, and Mr. William Williams has promised to give £100 to a certain Swansea charity if it can be proved by any expert and approved accountant that his firm have paid less wages than other masters in the same district. And thus the matter stands; what the end of the dispute will be we know not. The tinplate makers probably feel the action of the men the more acutely, on account of such determined stands as have been made lately being something new. For a considerable time they have had to contend with no bodies of workpeople as have masters in other trades, and they consequently feel it the more.

Whilst this strike is occupying a certain amount of attention in the Welsh tinplate trade, there is an equally important but much more pleasant process talked of. This is nothing more nor less than the syndicating of the tinplate trade. It is reported that a party of American capitalists are desirous of obtaining possession of the Welsh tinplate works, and are prepared to pay its rate of £3,000 per mill. It remains to be seen whether the negotiations can be carried out successfully or not. The makers ridicule the suggested valuation for one thing, and for another appear to doubt whether the necessary money can be found or not. There is little need for this latter doubt. The only weak point we can see in the scheme is the practical impossibility of keeping off competitors. Every man in North Wales, who has a few hundred pounds to spare, starts a tinplate works with the result that in periods of low prices failures are common. What is there to prevent a crowd of men establishing themselves in the trade in the event of the syndicate being successfully formed and putting up prices? Of course it may be objected that the syndicate being more powerful might undersell the new people—that the latter would carry on at bare prices for a considerable time, and the cutting of prices thus necessitated would but conduce to the financial success of any corner in tinplates.

It has been decided to increase the price of Siemens' tin bars by 5s., and Bessemer's by 7s. 6d. per ton.

True to their nature, the Cardiff people are crying cock-a-doodle-do! over the results of their port's trade in 1888. Taking into consideration only clearances with cargo, the Welsh port stands first, being ahead of both London and Liverpool—her increase being more than those of the two other ports combined.

It is, however, possible that Cardiff Docks may not be able to

much longer occupy this position. Barry and Rhondda and Swansea Bay Railway are both nearing completion, and when they are opened Cardiff cannot but feel some ill effects. The Barry Docks, it is stated, will be ready for opening in May, and the following month should see the Rhondda and Swansea Bay Railway open for mineral traffic. Then we may expect lively times in Wales. There can be little doubt as regards one fact, and that is that Rhondda and Swansea Bay shares are now a good purchase. With a fair amount of luck and good management, the line should prove a second Taff Vale. Not only does it top the far-famed Rhondda Valley, but it opens up an entirely virgin coal-field in the Avon Valley, where the coal will prove fully as excellent as that in the Rhondda Valley. It is to be regretted, however, that our Swansea capitalists have not, so far, taken any steps to open up collieries in this valley, although the new line is in operation already through the greater portion of the district.

The greatest attention in the coal trade during the past month has been caused by the attitude of the colliers, who raised a loud outcry as to their wages. Briefly put, the men's contention was that the sliding scale was unfair, that they did not receive wages in proportion to the increased price at which coal was selling. The strongest point that the masters could urge against the advance demanded by the men was that the middlemen and not the colliery owner reaped the advantages of higher prices, because the latter had made long contracts at the old price. There was every appearance of a strike, but this has fortunately been avoided by a little give and take. The men receive an immediate advance of 7½ per cent., to be increased to 12½ per cent. in May; they are to be paid weekly instead of fortnightly as hitherto, and in all possibility very important alterations will be made in the sliding scale arrangements.

In this district, as in others, the provisions of the new Railway Hotels Bill do not promise to benefit traders. Preferential rates are certainly being reached, but instead of a low scale being adopted, the companies are scheduling their highest rates, with the effect that in some instances rates are doubled. In a district like South Wales, where so much material comes from Staffordshire for use in the various works, this is felt very hardly. Then again, the coal trade will feel the burden of increased, or amended, rates also. The new arrangement will be felt particularly by the Newport traders, who are practically in the Great Western Company. As a natural result, freighters' associations have been formed in the various South Wales districts, and are being supported by all the chief traders.

The everlasting squabble about the Bristol Channel Harbour of Refuge still continues. Newport, Cardiff and Bristol are in favour of Lundy Island; Swansea prefers the Mumbles, but is willing to join the other ports named in an agitation if it can be agreed to leave decision as to most suitable site to an independent authority. This very reasonable proposal is objected to. The Cardiff Chamber of Commerce, for example, holds itself pledged to support Lundy Island. If a Refuge Harbour be necessary for protection of life and property in the Bristol Channel, bury the hatchet, and let all the authorities come to a decision to continually press the matter upon the attention of the Government. So long as the local ports continue their haggling on the subject, the authorities will make no move whatever.

The Bristol people have apparently come to the decision that the time has arrived for them to take active steps to make their port better liked by shipping people. It has dawned upon them that their system of pilotage is poor. The only surprising thing about this is that they came to no such decision long ago. A ship bound to Bristol now must take a pilot from Lundy Island: so if she only receives her orders at Penarth or the Mumbles, she must still pay pilotage as from Lundy. But this is not the only disadvantage under which Bristol labours—the tonnage up the river is a serious item, and we are sure that until this can be avoided, as well as the excessive pilotage, steamship owners will look askance upon this old city of the West.

The United States Consul at Cardiff, Major Jones, has sent to his Government a most interesting statement of British ship-building in 1888. Not only does the report deal with a bare record of 1888 productions, it contains statistics of the loss and gains of the world's tonnage for ten years; of the average size of ships built 1881-8; ships built for foreign owners, &c.; and, in addition to this, Major Jones touches upon the late shipping crisis, and what led up to it. Altogether the report is an excellent production, and fully bears out the high opinion

which Cardiff people entertain of the capabilities of the local representative of the stars and stripes.

South Wales industries have suffered a serious loss since our last issue by the death of Mr. Edwin Grice, who was, in addition to a connection with other works, the chairman of the Patent Nut and Bolt Co., Limited. Mr. Grice was deservedly and highly esteemed by all who knew him, and the place he occupied will not be easily filled.

Strangely enough, no adequate salvage plant has hitherto been owned in Cardiff, or, indeed, in the Bristol Channel at all. The only pumps were two, the property of the East Coast Insurance Clubs, of which Mr. J. C. Surlisby is the Cardiff representative. During the past month, however, Messrs. Baines, Guthrie & Co., of Cardiff, have procured from Messrs. Drysdale & Co., Glasgow, two complete sets of that firm's centrifugal, direct-rating salvage pumping engines. The plant has been put to some interesting trials, and has given great satisfaction.

Llanely has for some time been at great inconvenience as regards the railway facilities at the local works. We hear that this is about being remedied, the Great Western Railway Co. having decided to expend £7,000 in making the necessary improvements.

The ship repairing trade continues brisk at the three leading Welsh ports. As a matter of fact, one steamer was recently sent from Cardiff to Swansea for repairs, the repairers at the former place being so full of work.

There is not much doing in tin plates, due to different ideas as to values being held by the makers and consumers. The latter are quietly holding off.

There is not much to be said about copper, the Swansea people either knowing nothing, or not caring to say anything as to future movements.

Coal prices continue steady, and there is a good demand. Freights also keep firm.

### BELFAST TRADE NOTES.

WE are pleased to be able to record that the greatest activity is still the rule in all the yards, both in Belfast and Derry, and all the stocks are filled with vessels of large tonnage.

Engineers and machine makers are well employed, and some of the latter, we are glad to say, have booked good orders from Continental firms. Both iron and brass founders are doing good business, and a large amount of work which formerly went across the Channel is now being done at home. Marine boiler makers are very busy, and are nearly all working overtime; while other shops, engaged on land boilers, have nothing to complain of.

In many of the shipyards a temporary settlement has been arrived at between masters and men, wages being advanced, at the beginning of the month,  $7\frac{1}{2}$  per cent., with an understanding that no further alteration is to be made till June. There is now a considerable falling off in the number of enquiries for vessels, more especially those of large tonnage.

Coal is now imported into Belfast in greater quantities than it ever has been before, several large steamers having to be specially chartered, as the ordinary steamers and sailing vessels previously engaged in the trade were found incapable of dealing with the "volume of trade" in that direction. Further to meet the increasing requirements, the Harbour Commissioners are about to erect four new travelling jib cranes.

Writing late in March, work is still very plentiful in both the engineering and shipbuilding trades. At the last pay day a general increase of  $7\frac{1}{2}$  per cent. on piece-work wages, and an advance of 1s. to 2s. per week in time wages, was paid in the shipyards, but as the rate of wages of helpers has not been proportionately raised, there are many signs of friction still remaining, and the rivet heaters in one yard have brought matters to a head by striking for an advance of 3s. per week.

Messrs. Workman, Clarke & Co., of Belfast, have received an order from Mr. R. Tedcastle, of Dublin, for a steel screw steamer of 650 tons, the engines to be supplied by Messrs. Victor Coates & Co., of Belfast. Several large steamers are in a forward condition, and, late in the month, we are glad to say enquiries for new vessels were never more plentiful.

A much better delivery of material is now being obtained.

Belfast is not to be behindhand in the petroleum trade, a large company having been recently formed for importing it in bulk. A site has been secured near the Alexandra graving dock for the erection of a large steel tank capable of holding 3,000 tons of oil. A Birmingham firm has the contract in hand for its erection, which will occupy about four months.

### LEITH NOTES.

THE event of this month here was the launching, on the 2nd, of the largest vessel ever built in Leith. This vessel, the s.s. *Suffolk*, is a fine steel screw steamer of 3,362 tons gross register, with a deadweight capacity of 4,000 tons, classed 100 A 1 at Lloyd's, and built to the order of Messrs. Money, Wigram & Sons, Limited, London. She is intended for their Australian trade, a speed of 10 knots an hour being guaranteed. Messrs. Ramage & Ferguson, the builders of this vessel, have at present three vessels in their yard, while Messrs. S. & H. Morton & Co. have a like number building. Messrs. Hawthorns & Co. are proceeding with the first of their lighters for the Admiralty; they have also got the blocks set for another boat. The Russian steamer *Hurricane*, of Riga, is at present alongside the quay, being tripled by this firm, who will also supply a large new steel boiler.

The engine shops in all the yards are very busy, night and day shifts being still the rule. Several new orders have been placed here this month, and enquiries continue numerous. Messrs. Hawthorns & Co. have received an order for a steel trawler 105 ft. over all, to be supplied by them with engines of 45 N.H.P., while Messrs. S. & H. Morton & Co. have been fortunate in securing orders for two boats of the following dimensions:—one, Length, 185 ft.; breadth of beam, 28 ft.; depth moulded, 15 ft. To be supplied with compound engines, 17 in. and 38 in. by 30 in. stroke, and a steam pressure of 110 lb. Also one: Length, 224 ft.; breadth, 32 ft. 9 in.; depth moulded, 17 ft. Engines  $16\frac{1}{2}$  in., 27 in., 42 in., by 33 in. stroke. Steam to be supplied at a pressure of 160 lb. Messrs. R. Mackie & Co., Leith, have concluded the purchase of the steamer *Daylesford*, of Glasgow, to take the place, in their line, of the steamer *Newburgh*, which recently foundered in the North Sea. The *Daylesford* is a vessel of 908 tons register, with a carrying capacity of 1,800 tons, and is classed 100 A 1 at Lloyd's. She will be registered at the port of Leith.

### THE LOSS OF FRENCH TORPEDO BOATS.

THERE was a debate in the French Chamber on Saturday, March 23rd, on the loss of the torpedo-boat No. 110 off Point de Barfleur. It appears that the boat was one of a batch of 53, all built after the same pattern. One of them, No. 102, went down the other day outside Toulon Harbour, and two lives were lost. These 53 torpedo-boats were all accepted by the Navy Department without a single one of them being tried. An order for the construction of 30 boats was first given to a Havre shipbuilder when M. Brisson was Prime Minister, but cancelled. Subsequently the plans were changed, and an additional order for 23 was transferred to the Compagnie des Forges et Chantiers de la Méditerranée. This change was made when Admiral Aube was at the Ministry of Marine, and M. Charmer was engaged in trying to organise a movement hostile to England and to familiarise the public mind with a system of warfare in which small and fleet torpedo-vessels would be sent to attack merchantmen. Admiral Aube entered into M. Charmer's views, and the result of the alterations made was a rolling torpedo-boat which can only venture out of port in the calmest weather. They have a length of 115 ft., are 10 ft. wide, and draw 11 ft. Their engines are of 130 H.P. They are keelless and topheavy. It was thought that by changing the engines this flotilla might be enabled to weather heavy seas; but the fate of No. 110 shows that they are irretrievably unfit for any but harbour service. That boat and three others had been sent from Cherbourg to Havre to have their engines changed, and were returning to the former port when the accident took place. The sea was quite smooth when they set out; but soon afterwards the wind freshened and they got into a cross sea, in which they rolled about helplessly. As they were close together, they feared they might be knocked

against each other. Nobody saw No. 110 go down; it was missed suddenly. The idea is that it shipped a heavy sea and capsized. It was commanded by Lieutenant Villiers Moriam, and had on board a pilot, besides a crew of 12 sailors.

Admiral Krantz, in reply to remarks in the Chamber, said these vessels were so unsafe, especially with the wind on the quarter, that it had been arranged they should only be used for coasting service. After this double disaster they would not be employed until changes in the construction had been made in two of them by way of experiment. Then he would have them towed out to sea in rough weather without a soul on board, and if they did not sink or capsize under these conditions they might be made useful.

A correspondent gives the following account of the loss of the torpedo-boat 102 off Toulon, on the 1st of March, referred to above. Having manoeuvred all day off the coast, the boats were returning to port in single file, when No. 102, which occupied fourth place, suddenly capsized, rolling over on her side and then "turning turtle." The crew of 13 hands on deck were precipitated into the water, as well as the commanding officer. Three sank, and a like number who were below, consisting of a stoker and two engineers, had no chance of escape, as the slides on deck were closed, and they were drowned in their prison. The torpedo-boat, instead of sinking at once, continued to float bottom upwards, her screw revolving in the air. The other boats went to her assistance and rescued the men in the water by means of their dinghies. Tow lines were fastened to the capsized vessel and an endeavour was made to tow her into shallow water, but the line broke and she slowly foundered, three-quarters of an hour after turning over, in 17 or 18 fathoms.

## LAUNCHES AND TRIAL TRIPS.

### LAUNCHES.—ENGLISH.

**Arrow.**—On February 26th Messrs. Head & Barnard launched from their Groves Shipbuilding-yard an iron screw steamer named the *Arrow*, built to the order of Messrs. H. Leatham & Sons, York. Her dimensions are:—Length, 98 ft. b.p.; breadth, 18 ft.; depth, 8 ft. 2 in. She will be fitted with compound surface-condensing engines, to indicate about 110 H.P., with multi-tubular steel boiler, working at 120 lb.

**Columbia.**—On February 27th there was floated, from the large building dock at the Birkenhead Iron Works, the twin-screw mail and passenger steamer, *Columbia*, a magnificent vessel of great size and power, which has been built by Messrs. Laird Brothers to the order of the Hamburg-American Steam Packet Co., for the Atlantic service between Hamburg and New York, and may confidently be expected to take her place in the front rank of the unrivalled fleet now carrying on the service between Europe and America. The vessel is constructed entirely of steel, of scantlings to meet the requirements of the Bureau Veritas for their highest grade of classification, and in her design the great object aimed at has been to combine with highest speed and most superb passenger accommodation a practically unsinkable hull, to which end several novel features have been introduced in her construction. There is a double bottom for the whole length of the vessel, constructed on the cellular principle, and available for water ballast, and built with a watertight central division. The frames and plating in the bows are of increased strength to resist ice; the upper, main, lower and orlop decks are steel-plated from end to end. There are eleven transverse watertight bulkheads extending to the upper deck, with no doors or other openings below the main deck. There is a central bulkhead between the engines, so that each set of engines and each of the three groups of boilers, with its coal supply, is in a separate watertight compartment. The vessel has a length between perpendiculars of 463 ft.; the beam is 56 ft., and the depth in hold 36 ft., with a gross tonnage of about 7,000 tons, and a load displacement of about 10,000 tons on 24 ft. draught. An important factor as regards safety in case of accident to machinery or propellers is found in the two separate sets of engines, each with its own propeller—if one of these should be disabled the other would propel the vessel in perfect safety at about three-fourths of her maximum speed. The engines are on the triple-expansion principle, having cylinders 41, 60 and 101 in. in diameter, with a stroke of 5 ft. 6 in., supplied with steam from nine cylindrical boilers at 150 lb. pressure, and designed to develop 12,500 H.P. The boilers are of steel and placed in three distinct groups with

three funnels. The shafts and many other parts of the machinery are of steel. The passenger accommodation, which is for about 400 first-class, 120 second-class, and 580 steerage passengers, will be unsurpassed by any steamer afloat. The fittings and decorations of the dining saloon, music room, ladies' room and other apartments can be more adequately described when they are more nearly approaching completion, but it may be said that they are being carried out by Messrs. Bembé, of Mayence, at a cost and on a scale of magnificence rarely met with even in these days of lavish expenditure on decorative work. On the promenade deck there will be a ladies' room and music room, each of large dimensions, entrance hall and stairway to upper and main decks, first-class smoke room and bar, 13 first-class state-rooms, captain's and officers' rooms, second-class smoke room, ladies' room and entrance to second-class accommodation. Two dining saloons for the first-class passengers, sitting accommodation for 200 persons. On the upper deck in a deck-house amidships, the grand hall, about 67 ft. by 35 ft., capable of seating about 150 persons, and on the main deck another saloon for about 50 passengers—a total of 200 first-class. First-class state-rooms, ladies' retiring room, cabins and mess rooms for officers, barbers' shop, pantry, galley, &c., are distributed on upper and main decks. On the lower deck berths for steerage passengers, seamen's and firemen's quarters, store-rooms, &c. The vessel will be rigged with three pole masts carrying fore-and-aft sail only, and, as before stated, will have three funnels. She has a slightly raked stem, and an elliptic stern. A very complete electric installation will be provided, lighting the vessel throughout and comprising no less than 625 lights; and, as a precaution against accident, duplicate sets of dynamos will be fitted, either of which will be capable of running the total number of lights. Every detail conducive to the comfort and safety of the passengers has received the most careful consideration, and the ship will be replete with all the most modern appliances to this end. She will carry 10 large steel lifeboats, hung in the most approved manner and fitted with patent detaching gear, and in case of fire a most complete service for its extinction, both by water and by steam, throughout the whole ship, will afford the fullest safeguard. The *Columbia* was christened by Mrs. John Laird in the presence of a large number of visitors, among whom were Mr. John Meyer, of Hamburg, one of the directors of the Hamburg-American Co., Mr. Otto Schlick, of Hamburg, Mr. L. O. Bahr, German Consul, Liverpool, Mr. E. Meyer, Vice-Consul, Mr. E. Ritschard, superintending engineer, Mr. A. Wimmel, engineer inspector, Mr. E. Ellis, of the Bureau Veritas, &c. On leaving the building dock the *Columbia* was towed to the West Float and placed under the 90-ton crane, which closely adjoins Messrs. Laird's new boiler works, where the *Columbia's* boilers are in readiness for lifting on board.

**Athalie.**—On February 28th there was launched from the yard of the Strand Slipway Co., Sunderland, for Mr. Jacob Christensen, of Bergen, a screw steamer of the following dimensions:—Length, 285 ft.; breadth, 37 ft.; depth, 23 ft. 8 in. The vessel is being built under Lloyd's special survey, to be classed 100 A 1, and is also under the special survey of the Norwegian Veritas. The vessel has cellular double bottom and is fitted with four winches, donkey boiler, direct steam windlass, and all the most recent improvements. The engines, of the triple-expansion type, are being built by the North-Eastern Marine Engineering Co., Limited. On the vessel leaving the ways she was named the *Athalie*.

**Astral.**—On February 29th there was launched from the shipbuilding yard of Palmer's Co., at Jarrow, a steel screw steamer, built for Liverpool owners, of the following particulars, viz.:—Length between perpendiculars, 283 ft.; breadth, 38 ft., moulded; depth, 28 ft. 6 in., moulded. The vessel is rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's, and is of the spar-decked type. She is specially fitted and arranged for carrying petroleum oil in bulk, and for this purpose the hold is divided into a suitable number of oil-tight compartments. The vessel has capacity for about 2,700 tons of oil, and will be fitted throughout with the electric light. She was named the *Astral*.

**Edenmore.**—On March 2nd Messrs. Bartram, Haswell & Co. launched from their shipyard at the South Dock, Sunderland, a steel screw steamer for Messrs. W. Johnston & Co., of Liverpool. She is intended for their Danube line, and is specially constructed to carry a large cargo on a light draught of water. The following are the principal dimensions:—Length, 300 ft.; breadth, 41 ft.; depth, 19 ft. She has been built under special

survey for the highest class in Lloyd's Registry, and has been strengthened in some respects beyond their requirements. She is of the raised quarter-deck type, with a long bridge extending to the fore hatch, and a topgallant forecastle. Water ballast is fitted all fore and aft on the cellular principle, divided for trimming purposes. There are five large hatchways and a powerful steam winch at each, supplied with steam from a large multitubular boiler. The engines are being constructed by Mr. John Dickinson, and are of the triple-expansion type, the cylinders being 23½ in., 38 in., and 62 in. diameter respectively, with 42 in. stroke. They are supplied with steam from two large steel boilers, with extra large heating surface, working at 160 lb. pressure. As the vessel left the stocks she was named the *Edenmore*.

**Concord.**—On March 2nd Messrs. Thomas Turnbull & Son launched from their premises, Whitehall, Whitby, a screw steamer. Her dimensions are as follows:—Length over all, 268 ft. 9 in.; between perpendiculars, 258 ft.; breadth, 37 ft.; depth to top of floor-plate, 18 ft. 6 in. She is classed 100 A 1 at Lloyd's, and her d.w. carrying capacity is about 2,570 tons at 18 ft. Her engines are by Messrs. Blair & Co., Stockton-on-Tees, direct triple-expansion; diameter of cylinders, 20, 33, and 54 in.; stroke, 36 in.; nominal H. P., 140. The vessel was named the *Concord*, and has been built to the order of Messrs. Thomas Smailes & Co., Whitby. She is fitted with Emerson, Walker & Co.'s patent steam windlass.

**Argo.**—On March 2nd Messrs. Osbourne, Graham & Co. launched from their yard at Hylton, near Sunderland, a spar-decked steel screw steamer, which they have built to the order of Messrs. Lars Krogus & Co., of Helsingfors, for the Finska Angfartygs Aktiebolaget. The vessel has been built under special survey to Lloyd's highest class, and is of the following dimensions:—Length, 210 ft.; breadth, 30 ft. 6 in.; depth, 20 ft. 6 in. Provision has been made for 20 first-class passengers. She will be fitted with tri-compound engines by the North-Eastern Marine Engineering Co., Limited, of Sunderland. The cylinders are 17½ in., 28 in., and 48 in. in diameter, 33 in. stroke, and boilers working at 160 lb. pressure. The vessel was named the *Argo*.

**Cambria.**—On March 2nd Messrs. Laird Bros. launched a very powerful twin-screw tug steamer, which they have built to the order of the London and North Western Railway Co., for service at Holyhead, where she will, no doubt, prove most valuable in connection with the company's large fleet of steamers, trading between that port and Ireland. The *Cambria*, as she is named, was christened by Miss Dent, daughter of Admiral Dent, R.N., the company's well-known marine superintendent, who was also present. The vessel is built of steel, manufactured at the company's works at Crewe. She is 145 ft. long, 25 ft. broad, and 13 ft. deep in hold, with a tonnage of 432 tons d.w., and will be fitted with two independent sets of direct-acting inverted triple-expansion engines driving twin screws—the cylinders being 15 in., 23½ in., and 38½ in. in diameter, with 2 ft. 6 in. stroke, working at 160 lb. pressure, and supplied with steam by two steel boilers. The *Cambria* will be fully equipped as a first-class tug, and fitted with steam winch and windlass, driven by steam power, steam steering gear, &c. This is the twelfth vessel Messrs. Laird have built for the London and North Western Railway Co., and the second steamer of the same name, the first *Cambria* being a paddle-wheel steamer, 190 ft. long and 28 ft. beam, with engines of 350 H.P., and a speed of nearly 15 knots, built in 1848, for the improved service between Holyhead and Kingstown, organized in continuation of the railway system just then completed from Chester to Holyhead.

**Wastwater.**—On Saturday, March 2nd, Messrs. Edward Withy & Co. launched from their yard at Hartlepool, a large steel screw steamer, built to the order of James Huddart, Esq., of Melbourne. She is a large vessel, measuring over 330 ft. in length, constructed throughout of Siemens-Martin steel, and built to the highest class at Lloyd's. She has a long, raised quarter deck, short poop, long bridge house, and top-gallant forecastle. The holds are fitted with iron grain divisions and iron cargo battens; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after holds the vessel is built on the web frame system, which gives great strength and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and aft for water ballast (Withy & Sivewright's patent). The greater portion of the plates are in 24 ft. lengths, making the structure of the ship

very strong. Four steam winches, three donkey boilers, patent steam steering gear amidships, screw gear aft, direct steam patent windlass under forecastle; patent stockless anchors, hauling up into hawse pipes; and all other modern appliances are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the passengers, captain, &c., is well finished in polished hardwood, with painted panels, done in oils by the decorative staff of ladies employed by the firm. The steamer will be rigged as a two-masted fore-and-aft schooner, with steel pole masts, derricks, steam coal whips, and all other appliances for the expeditious hauling of cargo. The engines have been constructed by Messrs. T. Richardson & Sons, Hartlepool, and are of the triple-expansion type, with two large double-ended boilers, built for a working pressure of 160 lb. per square in. The hull and machinery have been constructed under the personal superintendence of J. Wotherpoon, Esq., of Port Glasgow. On leaving the ways the vessel was gracefully christened *Wastwater* by Mrs. Henry Withy, of West Hartlepool.

**Chili.**—On Saturday, March 2nd, Messrs. Richardson, Duck & Co. launched from their building yard, at South Stockton, a very fine steel spar-decked screw steamer, of the following dimensions, viz.:—Length over all, 366 ft. 6 in.; breadth, extreme, 42 ft.; depth of hold to spar deck, 28 ft. 4 in.; gross tonnage, about 3,000 tons. This vessel, built to the order of the Compagnie Maritime du Pacifique, of Havre, takes the highest class in both Lloyd's and Bureau Veritas Registers. She is fitted with a cellular bottom fore and aft for water ballast, has an iron main deck, and a steel spar deck covered with wood; a poop with accommodation for first-class passengers; a long bridge for second-class passengers, captain, officers, and engineers; and a top-gallant forecastle, in which third-class passengers and crew are berthed. She will be fitted with four steam winches, steam steering gear, Tyzack's patent stockless anchors, and all the latest improvements. The engines, by Messrs. Blair & Co., Limited, are triple-expansion, of 340 nominal H.P., cylinders 27 in., 45 in., and 74 in., by 48 in. stroke. The vessel has been under the supervision of M. Collet, the owner's superintending engineer. As she was leaving the ways she was gracefully christened the *Chili* by Mademoiselle Marguerite Barry, daughter of M. Barry, French Consul at Newcastle. She is fitted with patent direct-acting windlass by Emerson, Walker & Co., Limited.

**Screw Tug and Fire Float.**—On Monday, March 4th, there was launched from the shipbuilding yard of Messrs. Edward Finch & Co., Limited, Chopstow, a screw tug and fire float, built to the order of The Barry Dock and Railways Co. She will be fitted with fire-engine capable of throwing two 2-in. jets of water 200 ft. high.

**Urbino.**—On Monday afternoon, March 4th, there was successfully launched by Messrs. Robert Thompson & Sons, Southwick Yard, Sunderland, the steel screw steamer *Urbino*, built to the order of Messrs. Thos. Wilson, Sons & Co., of Hull. Her principal dimensions are:—Length between perpendiculars, 294 ft.; breadth, 39 ft.; and depth of hold to Lloyd's floors, 20½ ft. She has a raised quarter-deck from stern to engine-room bulkhead, a cape covering stern and wheel-house, with an awning-deck forward for the partial awning-deck. Class, 100 A 1; with accommodation for captain and officers in large house on awning-deck; also, charthouse; engineers in house on quarter-deck close to engine-room, and sailors and firemen are berthed forward. She is provided with very large hatchways, four extra-large steam winches and large donkey boiler, direct-acting steam windlass, by Emerson, Walker & Co., patent steam steering gear, which is placed in after wheel-house, and worked from midship bridge. She is built on the cellular-bottom principle for water ballast, and is fitted with fire-extinguishing pipes in each hold, lighthouses, patent stockless anchors, detaching gear to all boats, and all the latest improvements. The engines, by Messrs. T. Richardson & Sons, of Hartlepool, are tri-compound, and have cylinders 22 in., 35 in., and 59 in., with 39 in. stroke; the boilers are 13 ft. 6 in. by 9 ft. 9 in., and have a pressure of 160 lb. The vessel has been built under the personal superintendence of J. F. Wilkins, Esq.

**Sir Stafford Northcote.**—On March 4th Messrs. Forrestt & Sons launched from their ship and yacht building yard at Wyvenhoe a flush-deck, store-carrying sailing barge, for H.M.'s War Office. The principal dimensions of the vessel are:—Length, 86 ft.; breadth, 20 ft.; depth, 6 ft. 8 in. On leaving

the ways she was named the *Sir Stafford Northcote* by Miss Schneider, daughter of one of the partners of the builders' firm. The barge is fitted with Curel's patent windlass and steering gear, and all latest improvements with regard to working sails and cargo. The cabin aft is nicely fitted up in polished hardwoods, and the fore-castle forward is roomy and well-formed.

**Atalanta.**—On March 5th there was launched from the ship-building yard of Messrs. Palmer & Co., at Howdon, a steel screw steamer of the following dimensions, viz.:—Length between perpendiculars, 235 ft.; breadth, 31 ft. 6 in.; moulded depth, 22 ft. The vessel is rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. She is of the spar-decked type, the upper decks being of teak. She is designed for the fruit trade, and special attention has been given to the ventilation of the holds and 'tween decks. Water ballast is fitted in a double bottom throughout the main holds, and the vessel will be lighted throughout with the electric light. The vessel, which was named the *Atalanta*, has been built to the order of the *Atalanta Steamship Co., Limited*, and is to be run in Messrs. John E. Kerr & Co.'s line of fruit and passenger steamers between Jamaica and New York. The engines, which have also been supplied by the Palmer Co., are of the triple-expansion type, and the vessel is expected to attain a speed of 17 knots an hour.

**Falka.**—On March 5th Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer built to the order of Messrs. Herskind & Woods, of this port. This vessel will take Lloyd's highest class. Her dimensions are:—Length over all, 270 ft.; breadth, 36 ft. 6 in.; depth, 19 ft. 5 in.; with a long, raised quarter-deck, a long bridge to the fore-hatch, and a topgallant fore-castle. The saloon and cabins are aft, the engineers' rooms amidships, and the crew accommodation forward. The hull is built on the web-frame system, 5 hatches are fitted, 4 steam winches, steam steering gear amidships, screw gear aft, patent donkey boiler and patent windlass, boats on beams overhead, two masts with fore-and-aft rig, and all modern working appliances will be fitted for general trading. The Central Marine Engine Works of the builders supply fine triple-expansion engines, having cylinders 19 in., 30½ in., and 51 in. diameter, with a 36 in. piston stroke, and one large steel boiler to work at 160 lb. per square in., fitted with Fothergill's patent system of forced draught, from which, judging by the past results of the application of this system, great efficiency and economy are expected. She was gracefully christened *Falka* by Mrs. Woods, of Hartlepool, wife of one of the owners. Captain Petersen has superintended the building of the vessel, while the machinery has been constructed under the superintendence of Mr. J. R. Fothergill.

**Rugby.**—On Thursday, March 7th, Messrs. Earle's ship-building and Engineering Co., Limited, launched from their yard at Hull, a fine screw trawler, called the *Rugby*, which they have built to the order of Geo. F. Sleight, Esq., of Grimsby, for the purpose of North Sea fishing. In most respects she resembles the more recent additions to the Grimsby fleets constructed by Messrs. Earle, the main departures being in the dimensions, which are:—Length, 87 ft.; extreme breadth, 20 ft.; and depth of holds, 10 ft. 6 in.; and she is built of iron to Lloyd's 100 A class, with such special additions to the scantlings as have been found by experience to be desirable. She has a flush deck all fore and aft, and an iron casing over the engines and boiler: the accommodation for captain, mate and engineer being in cabin aft, and that for the crew under the deck forward. The vessel will be dandy rigged, and has a 6 by 10 steam trawling winch of special design, made by Earle's Co.; trawl ports and rollers on both sides; steering gear on raised platform amidships, and the usual provisions of bollards, hawse pipes, pumps, &c. The engines are of the compound type, made by Earle's Co., the cylinders being 17 and 32 in. diameter by 21 in. stroke, and supplied with steam from a large steel boiler made in accordance with Lloyd's rules, for a working pressure of 90 lb. per square in.

**Deramore.**—On March 9th there was launched from the shipbuilding yard of Messrs. C. S. Swan & Hunter, Wallsend, a steel screw steamer of the following dimensions:—Length, 300 ft.; breadth, 39 ft.; depth, moulded, 22 ft. 3 in. The vessel, which has been built under special survey, is of the partial awning deck, raised quarter-deck, and full poop type. She is classed 100 A 1 at Lloyd's under special survey, and in her construction the latest modern improvements have been

introduced. The engines are triple-expansion, 22½ in., 36½ in., 60 in. by 39 in., and of 160 lb. pressure, and capable of indicating 1,200 H. P. On leaving the ways she was named the *Deramore*. She has been built to the order of Messrs. Carlisle & Co., of London.

**Whitby.**—On March 9th Messrs. Joseph L. Thompson & Sons launched from their shipbuilding yard, North Sands, Sunderland, a steel screw steamer of 3,100 tons deadweight, built to the order of Mr. James Gray, of Whitby. The vessel is of the following dimensions, viz.:—Length, 284 ft.; breadth, 38 ft.; depth of hold, 19 ft. 5 in. She is built on the web-frame and longitudinal plate intercostal system, and is of the raised quarter-deck type. The fore and main hatches are fitted with iron trunks, thus providing for the requirements of the Grain Acts for 'tween deck vessels. The cargo holds are subdivided by six steel watertight bulkheads. The engines are of the triple-expansion type, and are of 900 I.H.P., having cylinders 21 in., 35 in., and 57½ in. respectively, with a stroke of 39 in., and with two steel boilers working at a pressure of 160 lb. per square in. The vessel was named *Whitby*.

**Speedwell.**—On March 15th the *Speedwell*, gunboat of the *Sharp-shooter* class, 735 tons, was launched at Devonport dockyard. The engines, by Laird, of Birkenhead, are made to develop a maximum H.P. of 4,500, which, if reached, will enable the ship to accomplish a speed of 21 knots. Her armament will be two 36-pounders, and four three-pounder quick-firing guns, one bow torpedo-tube, and a pair of torpedoes on each broadside.

**Wittekind.**—On Saturday afternoon, March 16th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a steel screw steamer built to the order of Mr. Johannes Lange, of Kiel. The particulars of the vessel are:—Length, 225 ft.; breadth, 30 ft.; depth of hold, 15 ft.; classed 100 A 1 Lloyd's, under special survey; water ballast, on the cellular principle, all fore and aft. The steamer is of the raised quarter-decked type, having full poop aft, in which is placed saloon and accommodation for captain and officers. There is also a long bridge amidships, which is extended and joined to the topgallant fore-castle, thus making her an awn ng-decked vessel forward, which will give her large storage for light weight cargoes. Three steam winches, large donkey boiler and patent windlass are fitted. The main engines are triple-expansion, by the North Eastern Marine Engineering Co. Limited, of Wallsend, having cylinders 17 in., 28 in. and 46 in., by 30 in. stroke; 160 lb. working pressure. Both hull and machinery have been built under the superintendence of Messrs. Menzies & Co. Upon leaving the ways the steamer was gracefully named *Wittekind* by Miss Tyndall, after which she immediately proceeded to the Tyne for shipment of machinery.

**B. T. Robinson.**—On March 16th there was launched from the yard of Messrs. John Blumer and Co., North Dock, Sunderland, a screw steamer, built to the order of Messrs. Robinson Bros., Whitby. The vessel, which is built on the cellular bottom system, and fitted throughout with web frames, is of the following dimensions:—Length, 275 ft. by 38 ft. by 17 ft. 5½ in. She is built to take the highest class in Lloyd's, and on completion will be fitted with all the latest improvements. On leaving the ways the vessel was named *B. T. Robinson*.

**Nil Desperandum.**—On March 16th Messrs. Cook, Welton, & Gemmell, shipbuilders, launched from their yard at Hull a steam trawler for the Humber Steam Trawling Co., Limited. The vessel was named *Nil Desperandum*. The dimensions of the ship are as follows:—Length, 100 ft.; breadth, 20 ft. 9 in.; depth, 11 ft.

**Ariel.**—On Saturday, March 16th, Messrs. W. Gray & Co., Limited, launched a large steel screw steamer, built to the order of Messrs. Rickinson, Son & Co., West Hartlepool, the dimensions of the vessel being 324 ft. over all by 40 ft. 6 in. beam, and 21 ft. 11 in. depth of hold, and the deadweight capacity 4,350 tons. The deck erections consist of a poop, long raised quarter-deck, long bridge extended to fore hatch and of extra strength, and a topgallant fore-castle. The poop contains a handsome saloon and state rooms, together with captain and officers' rooms, while the engineers' accommodation is in the after part of the bridge, and the crew's berths are at the fore part of same. The hull is strengthened with web frames, large hatchways are fitted, steam winches, steam steering gear amidships, and screw gear aft, Emerson, Walker & Co.'s patent windlass, two donkey boilers, double bottom under each hold for water ballast,

shifting boards throughout, two iron masts, square-rigged forward, and a complete equipment will be provided for general trading. The Central Marine Engine Works of Messrs. W. Gray & Co., Limited, supply the engines, which are of the triple-expansion type, of 1,200 H.P., and two large steel boilers, to work at 150 lb. pressure per square in. The christening ceremony was gracefully performed by Mrs. G. B. Rodway, Blundellsands, Liverpool, the vessel being named the *Ariel*. Captain Corner has superintended the ship during construction.

**Cambria.**—On March 16th Messrs. Joseph L. Thompson and Sons launched from their shipbuilding yard, North Sands, Sunderland, a steel screw steamer, of 3,100 tons deadweight, built to the order of the International Line Steamship Co., Limited, of Whitby. The vessel is of the following dimensions, viz.:—Length, 284 ft.; breadth, 38 ft.; depth of hold, 18 ft. 2 in.; is built on the web-frame and longitudinal plate intercostal system, thereby dispensing with hold and 'tween deck beams, and is of the highest classification at Lloyd's. The cargo holds are sub-divided by six steel watertight bulkheads, and the vessel is fitted with water ballast tanks fore and aft, being constructed on the cellular double-bottom principle. The engines are of the triple-expansion type, having three cranks. They are of 900 I.H.P. having cylinders 21, 35, and 57 in. respectively, with a stroke of 39 in. and two steel boilers of multitubular form, with a pressure of 160 lb. per square inch. The vessel was named the *Cambria*.

**Foyle.**—On March 16th this vessel was successfully launched from the yard of Messrs. Wm. Doxford & Sons, at Pallion. She has been built to the order of the Mercantile Steam Shipping of London, for the general trades, is entirely of steel, and to Lloyd's 100 A 1 class. The principal dimensions are:—Length between perpendiculars, 280 ft.; breadth, extreme, 38 ft. 3 in.; depth, moulded, 21 ft. With cellular bottom fore and aft. Her deadweight capacity on 19 ft. 6 in., being 3,100 tons. The engines are triple-expansion three cranks, by Messrs. Doxford, and with all their latest improvements, the cylinders being 21 in., 35 in., 57 in., by 39 in. stroke, and they are supplied with high-pressure steam from exceptionally large boilers. She is fitted with Bow. McLachlan's patent steam steering gear and Hastie's screw gear aft. Steam winches by Messrs. Welford, Bros., of Pallion, with the latest improvements for cargo purposes. The cabins are beautifully got up in hardwood aft, and give most comfortable quarters for captain and officers; engineers in after end of bridge, the crew and firemen being comfortably berthed in the forecabin. The vessel is a duplicate of the s.s. *Daniel* and the s.s. *Joseph John*, recently built by Messrs. Doxford. During construction the vessel has been superintended by Mr. Terrot Glover, the christening ceremony being gracefully performed by Miss Nelly Glover, of Sunderland.

**Benwick.**—On March 19th Messrs. Schlesinger, Davis & Co. launched from their shipbuilding yard, Wallsend, a large steel screw steamer named the *Benwick*, built to the order of Mr. Joseph Hoults, of Liverpool, the managing owner of the Ben Line of Steamers, of that port. The vessel is of the following dimensions:—Length between perpendiculars, 302 ft.; breadth, moulded, 40 ft.; depth, moulded, 23 ft. 2½ in., and is designed to carry a deadweight cargo of 4,000 tons. She is constructed on the cellular bottom principle throughout for water ballast, has a poop, long raised quarter-deck, long bridge extending beyond foremast, and a topgallant forecabin. Shifting boards and trimming hatches will be fitted to each hold in order to comply with the Grain Cargoes Act. She will be rigged as a two-masted fore-and-aft schooner. Maginnis's patent steering gear will be fitted in the engine-room, with shafting running along the deck, acting direct on to the quadrant, thus dispensing with all chains, rods, sheaves, &c. Messrs. Emerson, Walker & Thompson Bros.' patent steam windlass on the forecabin. The vessel will also be fitted with four powerful steam winches for the rapid loading and discharging of cargo, special arrangements being made on deck for the stowing of all cargo gear. The accommodation for the captain, officers and engineers is amidships in houses on the top of the bridge deck, the forecabin being fitted up in a substantial manner for the crew. The *Benwick* classes 100 A 1 in steel at Lloyd's, and has been built under special survey. The engines, of the triple-expansion description, are of 190 nominal H.P., having cylinders 22 in., 34 in. and 56 in. by 42 in. length of stroke. The boilers are of 10 in number, working at a pressure of 160 lb. per square inch. The machinery has been constructed by Messrs. Black,

Hawthorn & Co., Gateshead, and together with the hull, has been erected under the superintendence of Mr. A. C. Hay, of Liverpool, the owner's superintendent engineer. A large company assembled to witness the launch, there being present on the occasion Mr. and Mrs. Hoults, Miss Hoults, and other friends. On the vessel leaving the ways she was christened the *Benwick* in an unusually graceful manner by Miss Dora Hoults, the little daughter of the owner.

**Felix Touache.**—On March 19th Messrs. Wigham, Richardson & Co. launched from their Neptune Shipyards, Newcastle-on-Tyne, a spar-decked screw steamer, which is an addition to the fleet of the Compagnie Anonyme de Navigation Mixte of Marseilles, and is intended to trade between that port and Algiers. Her dimensions are:—260 ft. by 32 ft. by 25 ft. There will be accommodation provided for first, second, and third-class passengers, and the engines, which will be triple-expansion (Tweedy's patent), are by the same builders. As the vessel left the ways she was named *Felix Touache*.

**Transit.**—On March 19th there was launched from the yard of Messrs. Wood, Skinner & Co., Bill Quay, a steel screw steamer, built to the order of Wilhelm Wilhelmsen, Esq., of Tonsberg, Norway. The principal dimensions are:—Length, 250 ft.; breadth, 35 ft.; depth, 18 ft., moulded, with a deadweight carrying capacity of 2,100 tons. She is constructed on the cellular bottom principle, and, as well as taking the highest class at Lloyd's, will also take the highest class in Norwegian Veritas 1 A 1. The engines have been built to Lloyd's and Norwegian Veritas requirements, and are on the triple-expansion system, having cylinders 18½ in., 30 in., and 49 in. by 33 in. stroke, and are capable of indicating 750 H.P. The vessel, which was named the *Transit*, has been specially adapted for the Black Sea, Baltic, and India trades, and is fitted with all modern appliances for efficient and economical working.

**Maltby.**—On March 19th Messrs. Ropner & Son launched at Stockton a steel screw steamer of the following dimensions:—Length, 324 ft.; breadth, 40 ft. 6 in.; depth, moulded, 23 ft. 7 in. She has been built under special survey to class 100 A 1 at Lloyd's, and will carry 4,350 tons cargo and fuel on Lloyd's summer freeboard. She is built on the web-frame principle, and having very large hatches is well adapted for carrying heavy cargoes, and will have all the latest improvements for a first-class cargo steamer. Her engines are on the improved triple-expansion principle, of 1,200 H.P., with two steel boilers working at 160 lb. The steamer has been built to the order of Messrs. R. Ropner & Co., West Hartlepool. As she left the ways she was named the *Maltby*.

**Thurston.**—On March 20th there was launched at West Hartlepool, a steel screw steamer named the *Thurston*, built by Messrs. W. Gray & Co., Limited, for Messrs. Murrell & Yeoman, of that port. This vessel takes Lloyd's highest class, and will carry 2,700 tons deadweight; the dimensions being:—Length over all, 280 ft.; breadth, 37 ft.; depth, 20 ft. The hull is built on the web-frame system, with double bottom under each hold, and the equipment will be of the most modern description. She will be fitted with triple-expansion engines of 800 H.P., and two large steel boilers to work at 150 lb. pressure per square inch.

**Oruba.**—On March 20th the Naval Construction & Armaments Co. launched from their yard, at Barrow, the first of two vessels for the Pacific Steam Navigation Co. for the trade between Liverpool and Valparaiso. The ship is 450 ft. long, 49 ft. beam, and 37 ft. depth, and is rigged with four pole masts, the gross tonnage being 6,000. The lower deck and the after part of the main deck are constructed to accommodate 650 steerage passengers. Forward of the steerage accommodation sleeping berths are provided for 90 second-class passengers. At the extreme fore end of the main deck the firemen and crew are berthed. Between the crew space and the second-class passenger accommodation the remainder of the main deck is appropriated for the sleeping berths of 150 first-class passengers. The engines are triple-expansion, indicating 6,500 H.P., and steam will be supplied by five double-ended steel boilers at a pressure of 160 lb. per square inch. This machinery will propel the ship when fully laden at an average speed of about 16 knots an hour. The vessel was named *Oruba*.

**Ethiopia.**—On Thursday afternoon, March 21st, there was launched from the yard of her builders, Messrs. Raylton, Dixon & Co., a fine steel screw steamer, which has been built to the order of Messrs. Elder, Dempster & Co., of Liverpool. Her

dimensions are as follows:—Length over all, 330 ft.; breadth, 40 ft.; depth, moulded, 24 ft. 3 in.; with a deadweight carrying capacity of 4,400 tons. This vessel is built on the raised quarter-deck rule, but with the well filled in, thus joining the bridge and fore-castle, and is fitted throughout as a first-class cargo steamer. Her engines will be by Messrs. T. Richardson & Sons, of Hartlepool, with cylinders 24 in., 38 in., 64 in., by 42 in. stroke. On leaving the ways, she was gracefully christened *Ethiopia*.

#### LAUNCHES.—SCOTCH.

**Larnaca.**—On February 22nd Messrs. Russell & Co., Greenock, launched the steel screw steamer *Larnaca*, which is of the following dimensions:—Length, 298 ft.; breadth, 38 ft.; depth, 20 ft.; measurement, 3,000 tons. The *Larnaca* has been built for Mr. G. M. Steeves, Liverpool, and is to be engaged in the eastern trade. She will be supplied by Messrs. James Howden & Co., Glasgow, with triple-expansion engines of 1,200 I.H.P.

**Suffolk.**—On March 2nd there was launched from Messrs. Ramage & Ferguson's shipyard at Leith, the s.s. *Suffolk*, for Messrs. Money, Wigram & Sons, Limited, London, one of the oldest and most distinguished firms in the London and Australian trade. Gross tonnage, 3,362 tons register; d.w. capacity, about 4,000 tons. Classed 100 A 1 at Lloyd's; with poop, long bridge, and topgallant fore-castle; has cellular double-bottom fore and aft for water ballast; engines triple-expansion, built by Messrs. Ramage & Ferguson; the cylinders being 25½ in., 41 in., and 67 in. diameter, by 42 in. stroke. Supplied with steam from three boilers, made of Siemens-Martin steel, to work up to 160 lb. pressure. Steamer has four steam winches, steam windlass, steam steering gear, fresh water condenser, and all modern improvements. Has lighthouses for carrying side-lights on each side at fore end of bridge. She was named by Miss Simpson, of Trinity.

**Dora.**—On March 2nd Messrs. R. Napier & Sons launched from their shipyard at Govan a steel screw steamer for the London and South-Western Railway Co. This vessel has been specially designed for the passenger service between Southampton and the Channel Islands, and is intended to attain a speed of 16 knots. The dimensions of the steamer are:—Length, 240 ft.; breadth, 30 ft.; depth, 14 ft. 2 in., with a gross tonnage of about 800 tons, and classed under special survey at Lloyd's. Sleeping accommodation has been provided for 140 first and 60 second-class passengers. The builders will supply a set of triple-expansion engines of their most modern type, with two double-ended tubular boilers for a working pressure of 160 lb. The vessel was named the *Dora*.

**Cobra.**—On March 2nd the Royal mail steamer *Cobra* was launched from the yard of the Fairfield Shipbuilding and Engineering Co., Glasgow, for the service between the Clyde and Belfast. Messrs. G. & J. Burns, for whom the *Cobra* has been built, intend to establish a new daylight service. The principal dimensions of the *Cobra* are as follows:—Length over all, 275 ft.; between perpendiculars, 265 ft.; breadth of beam, 33 ft.; depth to promenade deck, 22 ft. 6 in.; and the gross tonnage will be about 1,000. She has been built under special survey of Lloyd's Registry to class A 1 for Channel service, and also under that of the Board of Trade for the passengers' certificate. The vessel has three decks. She will be fitted with a set of compound diagonal engines, having two cylinders and surface condenser. The indicated H.P. will be about 4,000. The diameter of the high-pressure cylinder is 50 in., and of the low-pressure cylinder 92 in., the piston-stroke being 5 ft. 6 in.

**A. F. Braga.**—On March 5th the Ailsa Shipbuilding Co., Troon, launched a twin-screw steamer to the order of Messrs. John B. Cameron & Co., Glasgow, representatives of the foreign owners. Dimensions are:—Length between perpendiculars, 172 ft.; breadth, 29 ft.; depth moulded, 9 ft.; gross tonnage, 400 tons. She is schooner-rigged, and is fitted with all the latest improvements. She will have triple-expansion engines 10½ in. by 17 in. by 28 in. cylinder and 18 in. stroke. Upon leaving the ways she was named the *A. F. Braga*.

**Brunel.**—On March 6th Messrs. Robert Duncan & Co., Port Glasgow, launched a steel sailing ship of 1,700 tons net register, for Messrs. Leitch & Muir, Greenock, of the following dimensions:—Length, 245 ft.; breadth, 39 ft.; depth of hold, 22 ft. 6 in. On leaving the ways the vessel was named *Brunel*.

She is a duplicate of the *Enterkin*, launched recently by Messrs. Robert Duncan & Co. for the Village Line. She will complete her outfit at Port Glasgow, and will afterwards load at Glasgow for Sydney and Newcastle.

**Saint Margaret.**—On March 6th there was launched from the shipbuilding yard of Messrs. Scott & Co., Bowling, a steel screw steamer of the following dimensions:—175 ft. by 26 ft. 6 in. by 13 ft., moulded, built to the order of Mr. Robert Harper, Glasgow, and intended for general coasting trade. The vessel is built on the cellular double-bottom principle, considerably in excess of Lloyd's requirements for their highest class, and is fitted with all the latest improvements for working. Triple-expansion engines, 15 in., 25 in., 40 in., by 30 in. stroke, will be fitted on board by Messrs. Wm. King & Co., Dock Engine Works, Glasgow. On moving down the ways the steamer was named the *Saint Margaret*.

**Strathclyde.**—On March 14th, Messrs. Alex. Stephen & Sons launched from their shipbuilding yard at Linthouse, a very handsome steel screw steamer of about 3,400 tons, built to the order of Messrs. Burrell & Son, Glasgow, and intended for general cargo trade. She was named the *Strathclyde* by Mrs. Geo. Burrell. The *Strathclyde* has been built to class 100 A 1 at Lloyd's, with scantlings in excess of Lloyd's requirements, and with structural arrangements qualifying her for Government Transport service. She is supplied with steam steering gear, independent steam windlass, and seven steam winches, and is in every way fully furnished with the most modern appliances for the safe and efficient working of ship and cargo. She has a full poop, long bridge, under which is accommodation for the captain, officers, and a few passengers; topgallant fore-castle, with comfortable provision for the crew; teak decks, and double bottom on the cellular principle for water ballast. Her engines, also constructed by Messrs. Stephen, and fitted on board before launching, are of their most approved triple-expansion type, having cylinders 25 in., 41 in., and 67 in., by 48 in. stroke, with two double-ended boilers of ample size, suitable for a pressure of 160 lb.

**St. Andrew.**—On March 18th Messrs. Simons & Co., Renfrew, launched, complete, the patent stern well hopper dredger *St. Andrew*. The particular feature of this dredger is the bucket ladder working through an opening in the stern instead of at the bow. The advantages thus gained are—improved speed and steering qualities, besides allowing of the construction of the forward part of dredger of greater strength to withstand heavy seas. Patent steering gear is fitted on the bridge forward, where an uninterrupted view ahead is obtained. The hoppers have a capacity to contain 500 tons of material, and the buckets will raise that quantity in little over an hour. The ladder will dredge to a depth of 43 ft. under water level. The engines—made by the builders—are two pairs of compound surface condensing, and, along with two steel boilers, are placed forward. Twin screws will propel the vessel at a speed of 8 knots an hour. The *St. Andrew* will be employed in the river Medway.

**Alexander III.**—On March 18th Messrs. Scott & Co., Greenock, launched a steel screw steamer named *Alexander III.*, built to the highest class at Lloyd's, and of the following dimensions:—Length, 260 ft.; breadth, 37 ft.; depth, 19 ft.; of 1,800 tons register, and a carrying capacity of 2,400 tons. The builders will supply triple-expansion engines, the diameter of cylinders being 18 in., 29 in., and 46 in. respectively, with a piston stroke of 39 in. The new steamer has been built to the order of the United Steamship Co. of Copenhagen, and she is to be engaged in the Black Sea trade.

**Dryfesdale.**—On March 21st there was launched from the shipbuilding yard of Messrs. Charles Connell & Co. a large, handsome screw steamer, built to the order of Messrs. Robert Mackill & Co., of this city, and intended to be employed by them in the Indian trade. Her tonnage is about 2,550 tons, with a carrying capacity of about 4,000 tons. She has been built of steel, and has been fitted with all the latest improvements, both in hull and machinery. Her engines, which will be supplied by Messrs. David Rowan & Son, Elliot Street, are of the triple-expansion type, having cylinders 23 in., 37 in., and 60 in., and 42 in. stroke, with two large double-ended boilers capable of working to a pressure of 160 lb. As she left the ways she was named the *Dryfesdale* by Miss Mabel Bost, 34, Lynedoch Street, Glasgow.

## LAUNCHES.—IRISH.

**British Empire.**—On February 28th there was launched at high water, from the shipbuilding yard of Messrs. Harland & Wolff, Queen's Island, Belfast, a fine new steel steamer, named the *British Empire*, built to the order of the British Shipowners' Co., Limited, Liverpool. The vessel's dimensions are:—Length, 345 ft.; breadth, 40 ft. 9 in.; and she has a gross tonnage of 3,100 tons. She will be fitted with triple-expansion engines, powerful steam winches, water ballast and all the most modern improvements and conveniences suited to the general trade in which the *British Empire* will be engaged. The new vessel is the eighth which has been built by Messrs. Harland & Wolff for same firm.

**Brandenburg.**—On March 2nd there was launched from the shipbuilding yard of Mr. Charles J. Bigger, Londonderry, a fine steel screw steamer, named the *Brandenburg*, of the following dimensions:—Length over all, 280 ft.; breadth, 35 ft. free; depth of hold, 22 ft. The *Brandenburg* was built to the order of the Liverpool & Maranham Steamship Co., Limited, for their passenger service between Liverpool and Brazil. As the vessel left the ways she was christened by Mrs. W. F. Bigger. The new steamer has accommodation for 80 saloon passengers, besides a large number of second-class and steerage. The saloon, which is aft, occupies the entire breadth of the vessel, and will be lighted by electric light, as will also be the state-rooms and officers' rooms; under the bridge deck is the second-class passenger accommodation, as well as a few additional state-rooms for saloon-passengers and mail room. The steamer was towed up to the finishing wharf, where she will receive her masts, rigging, and other fittings. She will afterwards be towed to the Mersey to receive her engines and boilers. The *Brandenburg* is expected to make a speed of 13 knots an hour at sea. The launch, which was most successful, was witnessed by a large concourse of spectators.

## LAUNCH.—SWEDISH.

**Tank Steamer.**—On March 1st a new tank steamer, for carrying petroleum, was launched from the Lindholmen shipbuilding yard, Sweden. She has been built on account of a Baku firm, and is so constructed that she can pass through the Russian canals to the Caspian Sea. The length of the steamer is 159 ft.; breadth, 28½ ft.; and draught, with 500 tons cargo, 9½ ft. The engine is 80 H.P. compound, with surface condenser. As in the steamer *Persijanin*, previously delivered to Russia from the same yard, the new steamer will have three pair of tanks, to the fore of the boiler and engine, for cargo, and two tanks at the sides of the boiler for fuel. A new cargo steamer for the United Steamship Co. of Copenhagen, of 1,240 tons, will now be commenced at the Lindholmen yard.

## TRIAL TRIPS.

**Duquesa de Vista Hermosa.**—On February 2nd the s.s. *Duquesa de Vista Hermosa* made her trial at the measured mile off Whitley, when the results showed a mean speed at the rate of 11.422 knots per hour. This is the second of two vessels built by Messrs. Palmers, of Jarrow, to the order of Messrs. C. de Murietta & Co., of London. The former, named *Marquesa de Santune*, was completed in September last, and has since been employed in the Black Sea and North American trade. As these vessels were specially built for running between Bilbao and the United Kingdom, they have been fitted with an unusually large capacity for water ballast, so as to enable them to cross the Bay of Biscay in all weathers in ballast trim; the total quantity of water carried is about 980 tons, partly in a cellular bottom under the engine-room, but the greater part in two deep tanks, one forward and one aft of the machinery space. The deep tanks are arranged so that they can be filled with cargo when required. The principal dimensions are:—Length between perpendiculars, 290 ft.; breadth, moulded, 40 ft.; depth, moulded, 21 ft. 4 in. The vessels are of steel, and are built to Lloyd's highest class; their deadweight capacity is 3,250 tons on 19 ft. draught. They are fitted with triple engines having cylinders 22 in., 35 in., and 58 in. in diameter, by 42 in. stroke. There are two return tube boilers loaded to 160 lb. per square in. Forced draught is provided on the closed ashpit principle, but it is only to be used as an auxiliary when from calm weather or inferior coals it is found

difficult to maintain steam. These vessels have been built under the superintendence of Mr. James Pollock, of 5 and 7, Fenchurch Street, London.

**Ataka.**—This steamer has lately left the Tees after a most satisfactory trial trip. The vessel is nearly 400 ft. in length, and carries 6,500 tons deadweight. She is built of steel, of the three-decked rule, and is fitted with all recent improvements. She has been built by Messrs. Ropner & Son, Stockton-on-Tees. Her engines are 500 H.P., on the triple-expansion principle, and at the time they gave the greatest satisfaction, the vessel attaining a speed of over 12 knots, everything working smoothly and well.

**Magicienne.**—The *Magicienne* has undergone a continuous 12 hours' steaming trial under natural draught. The stipulated H.P. to be indicated under the conditions named was 6,000, but the necessary mean was not reached, and a second trial will have to be made. The weather was exceedingly stormy during the run, but this did not affect the trial, the failure of which was due to defects in the combustion chambers of the double-ended boilers, which did not allow of steam being maintained.

**Rama.**—On February 16th this paddle steamer, constructed by Messrs. Burn & Co., at Howrah, India, for the Indian General Steam Navigation Co., ran a most satisfactory trial trip. The dimensions of the vessel are:—Length, 261 ft.; breadth, 35 ft. 6 in.; depth, 10 ft. 8 in. The hull is of steel throughout, has a longitudinal bulkhead in the centre from end to end, and several watertight cross bulkheads. The vessel is further strengthened by a lattice girder, which runs in the centre for about half its length between the lower and upper decks. The vessel is designed not only to be a powerful towing boat, but to carry a very large number of coolies, and has also ample accommodation for first-class passengers on the forward part of the upper deck. This upper deck is roofed from stem to stern in a style suited to the climate. The engines, which are independent and controlled by two steam starting gears, consist of two pairs of compound condensing diagonal engines, the high-pressure cylinders being 28 in. in diameter, and the low-pressure cylinders 50 in. in diameter, the stroke being 5 ft. Steam at 100 lb. pressure is supplied by four steel boilers 12 ft. in. in diameter, each boiler weighing without its motor 2½ tons. The engines work up to 1,400 I.H.P., and the speed of the vessel is 15 miles per hour. The paddlewheels are 18 ft. in diameter, and make 40 revolutions per minute. The engines and boilers were made by Denny & Co., Dumbarton.

**Otter.**—On Saturday, February 23rd, the patent hopper dredger *Otter*, after adjusting compasses, left for Port Natal, where it will be employed in connection with the extensive harbour improvements. The *Otter* was launched a short time ago by Messrs. William Simons & Co., Renfrew, and in the water presents rather an unusual though smart appearance, with its funnel and bridge placed well forward at the bow. This arrangement is necessary owing to the bucket-ladder opening being at the stern instead of at the bow, as is generally the case. It is propelled by two pairs of compound surface-condensing engines and twin screws; two rudders are provided and controlled from the bridge forward by patent steam steering gear. The dredging and steaming trials recently took place on the Clyde; the former trial at the entrance to the new Cessnock Dock, where all the dredging machinery underwent a thorough and exhaustive trial and with most satisfactory results. After being worked by each pair of engines separately, it was then worked by both pairs; one pair, however, is perfectly able to do the dredging. Having loaded its hoppers with fully 500 tons of debris, the dredger proceeded down the river, and the steaming trial was made with and against the tide, and when loaded fully a knot over the contract speed was obtained. The speed trial when light was even more satisfactory. The speed trials were witnessed by a number of gentlemen interested in dredging matters, amongst others, Messrs. R. P. Lyle, shipowner, Greenock, Hope Gilmour, C.E., G. W. Paton, and J. A. Jarvie. The Natal Harbour Board, for which the *Otter* has been constructed, was represented by Mr. D. Macalister, C.E., who superintended the construction of the dredger; and Mr. Jas. Stewart, the resident inspector. The same builders have on the stocks, almost completed and ready for launching, the *Beaver*, another hopper dredger of similar capacity. This vessel, instead of being fitted with the bucket ladder, has two very powerful centrifugal pumps for raising sand, &c. It is also intended for Natal.

**County Antrim.**—On February 23rd the new screw steamer *County Antrim*, left the Tyne on her trial trip. This vessel has been built by Messrs. Wood, Skinner & Co., Bill Quay. The engines are triple-expansion, and have been constructed by the North Eastern Marine Engineering Co., Wallsend, and have cylinders 20 in., 33 in., and 54 in., with a stroke of 36 in. The trial was very satisfactory.

**Reina Maria Christina.**—The Royal Spanish mail steamer *Reina Maria Christina*, built by Messrs. William Denny & Brothers, Dumbarton, for the Compania Transatlantica, went on her official speed trials on the Clyde last month. This vessel is a sister ship to the *Alphonso XIII.* Length, 400 ft.; breadth, 48 ft.; depth, moulded, 32 ft. The engines are on the triple-expansion principle, with cylinders 34 in., 57 in., and 91 in. diameter respectively, and with a piston stroke of 60 in. Steam is generated in three double-ended boilers, working to a pressure of 170 lb. to the square inch. Forced draught on the closed ashpit system is adopted. As a result of six hours' continuous running between the Cloch and Cumbrae lights on the Clyde, the mean speed was 17.4 knots under forced draught, while on another day, with the boilers working under natural draught, the speed was 16.9 knots. The results in the case of the sister ship—*Alphonso XIII.*—were 17.3 and 16.8 knots respectively.

**Munchen.**—On February 25th the new screw steamer *Munchen*, built by the Fairfield Shipbuilding & Engineering Co. for the Norddeutscher Lloyd of Bremen, went down the river for her speed trials, which were most satisfactory. Mr. J. C. Meyer and Mr. A. Knappl, who were present on behalf of the owners, expressed themselves very highly satisfied with the results of the trials, the vessels making on an average 13½ knots per hour, which is in excess of the contract. The *Munchen* has been specially constructed for the company's American service, and is similar in design to the *Dresden*, recently built by the Fairfield Co. for the same owners.

**Dionysios Stathatos.**—On February 26th the new steel screw steamer *Dionysios Stathatos*, built by Messrs. John Readhead & Sons, West Dock, South Shields, was taken to sea on her trial trip. The dimensions of this steamer are 280 ft. by 38 ft. by 18 ft. 9 in.; she is classed 100 A 1 at Lloyd's under special survey, and is of the improved well-decked type. The engines are of the triple-expansion type, having cylinders 21 in., 35 in. and 57 in. in diameter, with 89 in. stroke; steam is supplied at a pressure of 160 lb. per square inch by two large steel boilers. On the trial the engines worked very smoothly and satisfactorily. Several runs were made on the measured mile and along the coast, and the mean speed attained was 11 knots per hour. The *Dionysios Stathatos* has been built to the order of Messrs. Stathatos Bros., of Braila and Sulina.

**Torfrida.**—On February 27th the screw tug *Torfrida*, which has been built by Messrs. C. D. Holmes & Co. and Messrs. Cook, Welton & Gemmell, for Messrs. T. Gray & Co., Limited, of Hull, went upon her trial trip. The vessel made a capital run down the Humber, and when the Spurn Lightship was passed the log was set, and a full speed trip was made out to sea. After a lengthy run the log was hauled in as Spurn was again reached, when it was ascertained that the vessel had registered 12 knots per hour, a result deemed eminently satisfactory by all on board. The *Torfrida* is 106 ft. long, 19½ ft. broad, and 10½ ft. deep. Her screw is driven by triple-expansion direct-acting engines of 75 H.P. nominal, working up to 420 H.P. indicated. She has three cylinders of 14, 22 and 36 in. diameter, with 23½ in. stroke. Steam is supplied by a large steel single-ended boiler with two furnaces, which has a working pressure of 160 lb.

**Spanker.**—On February 27th the steel gunboat *Spanker*, sister ship to the *Sharpshooter*, recently launched, was launched at Devonport. The length of the boat is 230 ft., breadth 27 ft., with a displacement equal to 730 tons. Beside her guns, she will carry three torpedo tubes, and will be propelled by twin-screws driven by triple-expansion engines.

**Beagle.**—On February 28th the *Beagle*, the keel of which was laid in No. 5 dock on May 14th last year, was floated out at Portsmouth. She is a twin-screw sloop, having for sister the *Basilisk*, building at Sheerness, and practically resembles in dimensions, armament, and other respects the *Nymphæ*, *Buzzard*, and *Daphne*. An important and novel innovation, however, has been introduced into her construction. Her predecessor, the *Nymphæ*, was composite built—that is, with

steel frames, upon which were worked two thicknesses of teak and coppered; but in the case of the *Beagle* a complete steel bottom has been worked on the frames and covered with only a single thickness of teak for carrying the copper sheathing. Considerable interest is felt as regards the result of the experiment, as a double thickness of wood has hitherto been held to be indispensable to insure perfect insulation between the copper and the steel frames, and prevent galvanic action. In dimensions the *Beagle* measures 195 ft. between perpendiculars, and 30 ft. in beam, and has a mean draught of 12 ft. 5 in. with 160 tons of coals on board, and a displacement of 1,170 tons. Over the machinery and boiler spaces is a thin, watertight protective steel deck, and extra protection is also afforded by means of coal stowed in bunkers between the watertight and upper decks. The armament of the *Beagle* will consist of eight 5-inch breechloading guns on Vavasseur central pivot mountings, and six Nordenfeldt and a couple of Gardner machine guns. The machinery will be supplied by Messrs. J. & G. Rennie, of London, and consists of two sets of horizontal, triple-expansion, direct-acting engines. The collective H.P. will be 2,000, and it is expected that a maximum speed of 14½ knots will be realised. The *Beagle* is intended for distant foreign service.

**Wm. C. Mitchell.**—On February 28th the s.s. *Wm. C. Mitchell*, recently launched by Messrs. Wm. Doxford & Sons, Sunderland, for the Steam Navigation Co. of Ireland, Limited, of Belfast, went on her trial trip. There was a very heavy sea running, and, we are informed, she proved herself to be a thoroughly good sea boat; after which, compasses were adjusted, and she proceeded direct to Antwerp. She is a duplicate of the s.s. *Tangier*, recently built for the Angier (1887) Line, of London.

**Kaveri.**—On Tuesday, March 5th, the new awning-decked screw steamer *Kaveri*, lately launched by the Whitehaven Shipbuilding Co. for the Bombay Coast Navigation Co., proceeded down the Firth, having a full cargo of coal on board, for her official trial previous to leaving for Bombay. On the measured mile a mean speed of fully 9½ knots was attained with ease, the engines developing 915 indicated H.P. on a piston speed of 560 ft. per minute. This speed was considered most satisfactory, as the vessel has exceptionally full and bluff lines and was deeply loaded. She is classed 100 A 1 at Lloyd's, and to Board of Trade requirements for passenger service, and is divided into nine watertight compartments. There is a watertight bulkhead between engines and boilers, and the after-hold is divided longitudinally in the same manner; and as no doors have been fitted that can be left open in an emergency, the vessel is practically as safe as it is possible to make her. The upper decks are of teak wood; the cabin deck-house is of iron, with teak fittings; over all are a double set of awnings. For working cargo she has six handy hydraulic cranes, worked by a pair of special surface-condensing engines and accumulator in engine-room, fitted up by Messrs. Fullerton, Hodgart & Barclay, of Paisley. The steam steering gear was supplied by Messrs. Muir & Caldwell, and the steam windlass by Napier Brothers, and steam capstan-act by Messrs. Clark, Chapman & Co. The electric light has been fitted throughout, and also in mast-head, side lights and binnacles, by Mr. Rankin Kennedy. There are six steel life-boats, supplied by D. White & Co., having patent lowering apparatus. The propelling machinery was fitted by Messrs. Dunsmuir & Jackson, of Govan, and consists of a set of triple compound surface-condensing engines, cylinders, 16 in., 26 in., 40 in., by 30 in. stroke, having Brown's hydraulic starting gear, Kirkcaldy's patent feed heater, and all the latest improvements. The main boiler, which is of steel, is fitted with brass tubes, and works at a pressure of 160 lb. per square in. The donkey boiler, which is of the horizontal type, has also brass tubes, and is constructed to work at the same pressure as main boiler, so that it can be used to assist main boiler when required. Both boilers can be worked under a system of forced draught on closed stokehole system, by a large Tangye fan and engine. A steam ash-hoist is fitted up in stoke-hole. Fresh water for boiler is carried in large tanks in peak, supplied by fresh water condenser. The *Kaveri* proceeded to Bombay the following morning, under command of Captain Robertson.

**Grimsby.**—On Tuesday, March 5th, the new paddle steamer *Grimsby*, which Messrs. Earle's Shipbuilding & Engineering Co., Limited, has built for the M. S. & L. Railway Co.'s service between New Holland and Hull was taken on her trial trip with

a number of friends of the owners and builders on board, as well as the representatives of each party. After the compasses had been adjusted, a series of runs down the Humber and between Hull and New Holland were made to test the efficiency of the vessel. The *Grimsby* will shortly be placed on her station, where no doubt she will be much appreciated by the passengers on account of her comfort, convenience and elegance; and, moreover, her speed will enable her to considerably shorten the passage between the two piers, while on account of her very light draft, she can take a straight course across the river at almost any state of the tide, instead of having (as is the case with the present boats) to go round the bank at low water on spring tides. At the termination of the above trial the electric light installation, provided by Earle's Co., was run for some time in an efficient manner, and as this has been fitted throughout, it is expected to prove another material advantage over the old system of oil lamps.

**Petunia.**—On March 6th the s.s. *Petunia*, a well-deck vessel of 2,500 tons d.w., built by the Blyth Shipbuilding Co., Limited, of Blyth, had a most successful trial trip. This vessel left Blyth early in the morning for adjustment of compasses, and afterwards ran the measured mile several times at a speed highly satisfactory to all interested. The engines are of the tri-compound description, and have been supplied by Messrs. Black, Hawthorn & Co., Gateshead, and superintended by Mr. Ayrie, of West Hartlepool. After the trial the vessel returned to Blyth to load for Alexandria. The owners of the *Petunia* are Messrs. Lilly, Wilson & Co., West Hartlepool, and the commander is Captain Owen.

**Athena.**—On Monday morning, March 11th, the *Athena*, which has been built by Messrs. Raylton, Dixon & Co. for Mr. Robert H. Penney, Brighton, proceeded from the Tees for her trial trip. This vessel, which is built with raised quarter-deck, topgallant forecabin, and long bridge, is of the following dimensions:—Length, 304 ft. 3 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in., with a d.w. carrying capacity of over 3,600 tons. Her engines, which have been fitted by Messrs. T. Richardson & Sons, of Hartlepool, are on their triple-expansion system, having cylinders 22 in., 35 in., and 59 in. by 39 in. stroke.

**Sikh.**—On March 12th the *Sikh* (s.), the latest addition to the fleet of the Mogul Steamship Co., Limited, went out to sea for a trial run. The vessel being quite light, the speed results obtained were not of much practical value, but such as they were were highly satisfactory.

**Singapore.**—On March 14th the screw steamer *Singapore*, built and engined by Messrs. Fleming & Ferguson, Paisley, went down the Clyde on a trial run for the purpose of testing her speed and coal consumption. On the measured mile she made 12½ knots, her indicated H.P. was 1,600, and her coal consumption per hour amounted to 16 cwt. 12 lb., giving the low average of 1.121 lb. per I.H.P. per hour. The engines worked without a hitch of any kind, and the greatest satisfaction was expressed at the result of the trial.

**Porro.**—On March 14th the s.s. *Porro*, built by the Grange-mouth Dockyard Co., and engined by Messrs. Hutson & Corbett, Kelvinhaugh Works, Glasgow, went on her speed trials on the Firth of Forth. The vessel, which is built of Siemens steel, is of the following dimensions:—Length, 172 ft.; breadth, 26½ ft.; depth, 13 ft. She has been built to the order of Messrs. Willumsen & Jessen, Christiania, Norway, for their African trade. The engines are of the triple-compound type, with cylinders 12 in., 20 in., and 32 in. respectively, with a piston stroke of 24 in. Two boilers, each 8 ft. 9 in. in diameter, and of the same length, supply the steam. There are four furnaces, the heating surface being 1,150 square ft., grate surface, 44 square ft. At the trials the speed attained was 10½ knots, with the engines working at 110 revolutions, while the pressure was 160 lb. to the square in. The diameter of the propeller is 9 ft. and the pitch 12 ft.

**Speedwell.**—On March 15th the *Speedwell*, a torpedo gunboat of the *Sharpshooter* type, designed by the Constructive Department at the Admiralty, and the third vessel of her class launched at Devonport Dockyard since November last, left the ways in one of the slips of that establishment, the christening ceremony being performed by Miss E. R. Cooke, daughter of Admiral Cooke, of Plymouth.

**Eden Vale.**—On Saturday, March 16th, the new awning-decked screw steamer *Eden Vale*, lately launched by Messrs.

S. McKnight & Co., Ayr, for Mr. Joseph Wright, executor of the late Mr. John Bacon, Liverpool, for his Liverpool and Wexford passenger and cattle trade, proceeded up the Firth of Clyde for her official trial, previous to her going to Ardrossan to load for Swansea. On the measured mile a mean speed of fully 12 knots was attained with ease, the engines developing 600 I.H.P. on a piston speed of 460 ft. per minute. This speed was considered most satisfactory.

**Chancellor.**—On Monday, March 18th, the steam screw-line fishing vessel *Chancellor* left the moorings at North Shields with a large company of gentlemen on board. This vessel, which has been built by Mr. J. T. Eltringham, of South Shields, is of the following dimensions:—Length between perpendiculars, 80 ft.; breadth, 16 ft. 6 in.; depth, 10 ft. Her engines are compound surface-condensing, of 27 nominal H.P., having cylinders 13 in. and 25 in. diameter by 18 in. stroke. The vessel ran as far as Amble, attaining an average speed of 9½ knots per hour, but owing to a strong swell was not able to enter, and so made for Blyth.

**Earnford.**—On March 18th the *Earnford*, built by Palmer's Co., Jarrow, proceeded on her trial trip. An average speed of above 11 knots an hour was attained over the measured mile, and the engines worked well and smoothly. The vessel has been built by Palmer's Co. for the Earn Co.

**Port Caroline.**—On March 20th the Port Caroline (s), belonging to the firm of Messrs. W. Milburn & Co., left the Tilbury Docks on her first voyage to Melbourne. This is the latest addition to the fleet of 10 other full-powered steamers engaged in the London and Australian trade managed by the above firm, and, owing to her special adaptation for this trade, demands more than a passing notice. Her dimensions are:—Length, 395 ft.; breadth, 44 ft.; and depth 29 ft. 6 in., with a capacity of 6,000 tons. This steamer, like some other recent vessels of this class, is fitted with a graceful cutwater and figurehead, thereby adding to her otherwise finely modelled form to a much greater extent than was formerly the case with the straight stem usually adopted. The fittings are of the most sumptuous character, the saloon in particular being arranged and furnished in the best artistic and attractive style. A luncheon was given on board a few days ago by the managing owners to a large number of the leading underwriters and shippers, when most unqualified praise was expressed at this latest production of a type of vessel specially designed for this rapidly-increasing Colonial line. The vessel was built by Messrs. W. Dobson & Co., and engined by Messrs. Wigham, Richardson & Co., both Tyne firms, and at a her trial trip realised a speed exceeding 15 knots.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

### WASTING AWAY OF CONDENSER TUBES.

To the Editor of THE MARINE ENGINEER.

SIR,—Two cases similar to that mentioned by "A Marine Engineer," in your issue of January 1st, have been observed by me in steamers under my superintendence. In the first instance the tubes wasted where they came into contact with the wood ferrules so quickly, and were so expensive that new tube plates with screw ferrules and cotton packing were fitted, and which have been in use for ten years up to the present time, without giving any trouble whatever. The second case now exists in a pair of compound engines, condenser two years old, in which two sets of tubes have already been fitted from the same cause, and I have now on order tube plates and tubes to treat it similarly to the first case.

It is my opinion, based on careful observance of existing conditions, that the tubes, which are 7.5 ft. long, having no centre supporting plate, get a springy motion imparted to them by the water passing through, thus causing a continuous friction between their externals and the wood ferrules, which

friction in a very short time makes the ferrules slack and wastes the tubes as described. It should be particularly noted that the tubes do not wear save where they come in frictional contact with the damp wood, and as is the case here—the water being very dirty—mud and gritty substances accelerate greatly the destruction of both tubes and ferrules.

Such, in my opinion, is the cause of your correspondent's complaint, and the most effective remedy lies in securing the tube ends in the manner I have described.

Trusting my statements will elicit further information from others,

I remain, yours truly,

G. W. ROCKCLIFFE.

Demerara, British Guiana, 4th February, 1889.

#### SIR W. THOMSON'S PATENT COMPASS.

To the Editor of THE MARINE ENGINEER.

SIR.—With reference to Sir W. Thomson's action against our firm for alleged infringement of his patent, will you kindly allow us to state, through your widely-read columns, that what we are contending for and have good evidence to prove, is that Sir W. Thomson has no right to claim the prior and exclusive use of short needles to compass cards, an open card, or to restrict the lightness of the card, so long as the latter is not constructed with the silk radial threads as used by him.

We are, Sir, yours obediently,

H. HUGHES & SON.

Opticians and Compass Makers, 59, Fenchurch Street, London.

### Miscellaneous.

**CENTENARY OF STEAM NAVIGATION.**—We have pleasure in drawing the attention of our readers to an advertisement on page xxxiii of the proposed "Symington Memorial," especially as it was through the MARINE ENGINEER that the key-note was sounded in the shape of a letter, &c., as far back as January, 1897. We are pleased to note that amongst shipowners and others that Sir Donald Currie, M.P., heads the list of the members of committee, and amongst others who figure as subscribers (in addition to Sir D. Currie), we notice the names of the Earl of Zetland, the Earl of Ravensworth, McGregor, Gore & Co., P. Denny, Esq., Grangemouth Dockyard Co., T. D. Brodie, Esq., J. C. Boulton, Esq., M.P., Carbrook, Andrew Stewart, Esq., Clyde Tube Works, Glasgow, John Sinclair, Esq., M.P., R. Binnie, Esq., Provost of Gourrock, Hugh Macpherson, Provost of Grangemouth, &c.

**"CITY OF PARIS."**—The Inman & International Steamship Co.'s new steamer *City of Paris* has arrived at Liverpool from the Clyde, after performing a very successful trial trip. Her speed from the Calf of Man to the North-west Lightship, in face of strong winds and a somewhat adverse tide, was fully 21 knots. There was not a hitch in the performance of the engines throughout all the trials. She will sail from Liverpool for New York on Wednesday, April 3rd, and from New York for Liverpool on Wednesday, April 17th.

**SHIPBUILDING CONTRACT FOR PAISLEY.**—Messrs. Fleming & Ferguson, shipbuilders and engineers, Paisley, have received an order to build a steel screw steamer for a firm in the north of Scotland. She is to be fitted by the builders with their new type of quadruple expansion engines.

**MARINE CONTRACT FOR PAISLEY.**—Messrs. Fleming & Ferguson, Paisley, have received an order for a set of their patent quadruple expansion engines for a steamer to be built for Messrs. McBeth & Gray, Glasgow. These engines are to indicate 1,600 H.P., and are to be a duplicate of a set lately fitted by Messrs. Fleming & Ferguson into s.s. *Singapore*.

**THE LONGEST SAILING SHIP AFOAT.**—The four-masted ship *Lancing*, of London, claims the distinction of being the longest sailing ship afloat. She was built on the Clyde in 1866 by the firm of Messrs. Napier & Son, for the French Compagnie Generale Transatlantique, for their trade between Havre and New York. She was then a screw steamer of 3,343 H.P., and bore the name of *Ville de Paris*. During last year she was sold

by her French owners to Mr. F. Lamb, of Sunderland, and by him to the Blyth Dry Dock Co., Limited, of Blyth, who have converted her into a four-masted sailing ship. Her dimensions are:—Length, 345 ft.; breadth, 43 ft. 7 in.; depth, 29 ft.; tonnage, gross, 2,678. She is thus 12 ft. longer than the *Liverpool*, which is the largest sailer afloat. The *Lancing* sailed from London for Melbourne on the 6th of March.

It is announced that the summer meeting of the Institution of Mechanical Engineers will this year be held in Paris; the meeting will commence on the 2nd of July, and will last four days.

**THE S.S. "DUKE OF BUCCLEUCH."**—The following is a list of the engine-room staff of the steamer *Duke of Buccleuch*, which, it is supposed, was lost off Bognor with all hands on March 6th, after collision with the *Vandalia*:—T. Sutherland, chief engineer; F. H. Mee, second engineer; F. W. Wake, third engineer; F. W. Cockle, fourth engineer.

**DESIGNS OF THE NEW BATTLE SHIPS.**—We understand that the Director of Naval Construction, Mr. W. H. White, proposes, with the consent of the First Lord of the Admiralty, to read a paper upon the designs of the new battle ships before the Institution of Naval Architects at their next meeting. The value and accuracy of Sir E. J. Reed's opinions both as a designer and shipbuilder will thus be tested by a competent and technical body. Sir E. J. Reed is a vice-president of the institution.

### BOARD OF TRADE EXAMINATIONS.

#### EXTRA FIRST CLASS.

January 26th, Swan T.D.; Extra 1C, North Shields.

January 26th, 1889.

Almond, J. ....	1C N. Shields
Astles, J. ....	2C Liverpool
Bardall, W. ....	1C Sunderl'd
Bond, J. ....	1C Liverpool
Buchanan, D. ....	2C "
Campbell, J. H. ....	2C N. Shields
Care, A. ....	1C London
Elliott, C. ....	2C Cardiff
Frier, W. J. ....	2C N. Shields
Gladde, C. S. ....	1C Sunderl'd
Grainger, T. J. ....	2C London
Johnson, J. W. ....	2C Sunderl'd
Kennedy, W. J. ....	2C "
Lockyear, F. W. ....	1C Hull
MacLachlan, D. ....	2C "
Maddison, G. D. ....	2C Sunderl'd
Manson, W. J. ....	2C N. Shields
Mew, J. T. ....	1C London
Nicholls, H. ....	1C N. Shields
Pullin, F. J. ....	1C London
Read, W. ....	1C Hull
Robertson, J. ....	2C Sunderl'd
Ross, S. ....	1C "
Ryan, T. ....	1C Liverpool
Shaw, J. ....	2C London
Shores, M. ....	2C Hull
Sparks, W. B. ....	2C Liverpool
Spetch, C. ....	1C Hull
Thomson, O. ....	2C London
Watt, W. ....	2C N. Shields
Whitell, A. L. ....	1C London
Wilkinson, T. ....	2C Hull
Willans, J. P. ....	2C Cardiff
Williams, H. ....	1C Cardiff

February 23rd, 1889.

Adamson, W. H. ....	2C Aberdeen
Beatson, D. ....	2C Glasgow
Bevan, Wm. D. ....	2C Liverpool
Boothroyd, H. T. ....	2C London
Cairns, W. ....	2C Glasgow
Carman, R. ....	1C N. Shields
Clark, Hugh ....	1C Liverpool
Clymont, Geo. M. ....	2C "
Collins, G. ....	1C Glasgow

Cook, T. ....	1C Cardiff
Davey, M. W. ....	1C Liverpool
Dow, A. ....	2C Glasgow
Ellis, Albert ....	1C Liverpool
Harvey, G. M. ....	1C Aberdeen
Hayes, T. ....	1C Liverpool
Heathcote, H. J. ....	2C "
Heatherington, J. ....	2C Liverpool
Hogg, W. ....	2C Glasgow
Jones, D. ....	2C Cardiff
Kennedy, J. ....	2C Glasgow
Kidby, E. C. ....	2C Cardiff
McDonald, W. B. ....	1C London
McInroy, J. ....	2C Glasgow
McLean, G. ....	1C Cardiff
Parker, Alex. ....	1C Glasgow
Payton, Fk. Jno. ....	1C Bristol
Priestly, Thos. M. ....	1C London
Purvis, T. ....	1C Liverpool
Reed, Thos. ....	2C Cardiff
Shore, Wm. C. ....	2C London
Scrington, Jno. J. ....	1C N. Shields
Smith, George ....	2C Aberdeen
Smith, James ....	2C Glasgow
Soul, Thomas ....	2C Liverpool
Truran, Wm. ....	2C Cardiff

March 2nd, 1889.

Barker, Jas. ....	2C Sunderl'd
Briggs, H. E. ....	2C N. Shields
Dasher, E. H. ....	2C S'th'p't'n
Dean, John ....	1C Liverpool
Dixon, Fredk. ....	1C Sunderl'd
Galloway, T. ....	1C N. Shields
Honeywill, C. K. ....	2C N. Shields
Hooper, W. F. ....	2C "
Ledder, Richard ....	2C London
Logan, Wm. ....	1C Sunderl'd
Mather, T. H. ....	2C N. Shields
Mulders, G. W. ....	2C London
Park, John ....	2C N. Shields
Perrin, George ....	2C "
Probert, Jos. ....	1C Sunderl'd
Purvis, Wm. ....	1C "
Rickson, Joseph ....	1C "
Ritchie, John ....	2C Hull
Rutter, John W. ....	2C N. Shields

Sinclair, T. .. 2C Sunderl'd  
Stewart, W. B. 1C Liverpool  
Thompson, J. H. 1C N. Shields  
Tidey, W. G. .. 2C "  
Tod, Geo. W. .. 1C Liverpool  
Walker, Charles 2C Sunderl'd  
White, Daniel.. 1C Hull  
Wilson, Samuel 1C N. Shields  
Wokes, Charles 2C Hull

March 9th, 1889.

Annan, J. .... 1C Glasgow  
Bainbridge, J. L. 2C N. Shields  
Ballie, John .. 1C Greenock  
Barnes, Geo. J. B. 2C London  
Bolton, James.. 2C Greenock  
Carmichael, Robt. 1C Glasgow  
Clarke, P. E. V. 2C London  
Cowan, David.. 1C Glasgow  
Craig, John Geo. 1C N. Shields  
Davies, John .. 1C Cardiff  
Dickinson, Thos. 2C Liverpool  
Evans, Wallace 2C London  
Gallie, James .. 1C Greenock  
Gibb, John J. .. 2C N. Shields  
Gray, Robt. .. 1C Glasgow  
Harding, Thos. 2C Cardiff  
Harvey, James 2C Glasgow  
Haswell, Fredk. 1C N. Shields  
Hibbard, John 2C Liverpool  
Howells, B. P. .. 1C Cardiff  
Innes, Alexr. .. 2C Liverpool  
Jenkins, Edwd. 2C Cardiff  
Kelly, Samuel.. 2C Glasgow  
Lumsden, Geo. E. 2C N. Shields  
Mackie, James 2C Greenock  
McKenzie, John 1C Glasgow

McIntyre, John 2C Glasgow  
Mitchell, A. E. 2C Cardiff  
Parry, James R. 1C N. Shields  
Pearson, George 1C Glasgow  
Richardson, A. 2C London  
Russell, R. W. 2C N. Shields  
Smith, John H. 1C Hull  
Stewart, Sam. T. 1C N. Shields  
Tait, Andrew .. 1C Glasgow  
Weatherill, C. E. 1C Cardiff  
Wilcox, John .. 2C London

March 16th, 1889.

Adamson, David 2C London  
Anderson, L. .. 2C Leith  
Brough, Robt. 1C "  
Brownlee, W. S. 1C "  
Brymer, P. Begg 2C Dundee  
Cockburn, John 2C N. Shields  
Cowley, Thos. .. 2C Liverpool  
Duguid, H. C. 1C N. Shields  
Fowell, R. .... 2C Liverpool  
Gardner, Henry 2C "  
Gibson, James.. 2C "  
Grantham, C. H. 2C N. Shields  
Hall, James .. 1C "  
Holdcroft, J. S. 2C Leith  
Honeyman, W. 1C N. Shields  
Hutchinson, W. A. 1C "  
Jobson, Albert 2C "  
Kilburn, F. .... 2C Leith  
Nash, Alfred .. 1C "  
Neil, Wm. .... 1C "  
Pirie, Alexander 1C "  
Taylor, Wm. C. 1C "  
Todd, W. J. .. 1C Dublin  
Troup, C. L. .. 1C Liverpool

### Recent applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, from February 11th to March 16th, 1889.

2368 W. P. Hoskins. Ships' berths.  
2393 W. E. Heath. Ventilating ships, &c.  
2394 Haddan (R. Sabater y Casals & R. Sabater y Fajula).  
Screw-down cocks.  
2410 J. B. Harris. Piston rod packing.  
2478 J. Rettie. Propelling ships, &c.  
2521 H. Day & S. F. Read. Disengaging and connecting  
ships' boats.  
2558 Mewburn (M. von Izabel). Navigable vessels.  
2559 G. W. Heath. Ships' course correctors.  
2587 C. T. Davenport & E. J. Horsley. Pistons.  
2596 H. Griffin. Button for sculls, oars, &c.  
2608 W. Beaumont. Centrifugal pumps.  
2757 J. Dewrance (R. N. Pratt). Gate valves.  
2762 B. Smith. Starting motive power engines.  
2763 Yates (F. B. Dobson). Preventing articles upsetting on  
board ship during a rough sea.  
2777 J. F. Green. Life boats.  
2788 Willcox (C. E. G. Lundstedt & C. J. F. M. Lilliehöök).  
Valves.  
2793 G. W. Merrett & W. Worthington. Steam boiler furnace  
smoke consumer.  
2804 D. Taylor. Steering, &c., of torpedoes.  
2810 H. MacColl. Feed heaters for steam boilers.  
2818 W. Roadhouse. Metallic packing for glands, &c.  
2887 D. A. Cormack. Intercepting waste heat from exhaust  
steam of condensing engines.  
2897 W. B. Thompson. Engine starting gear.  
2898 Ditto. Plating for ships.  
2948 Luke (F. H. Lafarge & H. J. Barker). Steam engines.  
2965 W. H. Melaney. Armour plates.  
2979 T. C. Watson. Tables for sea-going vessels.  
3006 Ede Vries and H. W. van Raden. High-pressure valves.  
3038 G. Scoular. Loading vessels, &c.  
3051 W. C. Roe. Projectile.

3113 A. E. Tavernier and E. Casper. Gauge for indicating  
pressure of fluids.  
3136 J. Larmanjat. Screw-down valves.  
3173 G. Thomson. Direct-acting duplex engines.  
3176 R. G. Schmitz. Pressure-reducing valve.  
3177 A. L. Bayley. Ships' berths.  
3204 E. J. Lotze. Propulsion of vessels.  
3284 C. Cole & J. W. Booth. Motive-power engines.  
3325 W. C. Lockwood. Feed water heater.  
3336 W. E. Heath. Preventing collision of ships.  
3348 R. J. H. Eccles. Boat propeller.  
3446 A. Bray. Rudders.  
3469 L. C. Huson & The Huson Motor Co., Limited. Rotary  
engines.  
3475 Kühne (W. R. Proell). Expansion gear.  
3478 J. H. Heck. Circulating water in vertical boilers.  
3490 W. P. S. Edwards. Tidal water engine.  
3499 A. Mechan. Electric telegraphs for use on board ship.  
3509 T. Thorp. Speed and pressure indicators.  
3552 L. G. Cresswell. Packing for glands.  
3554 J. E. Surridge. Retarding apparatus for vessels.  
3603 F. W. Haywood & F. Mills. Propulsion of steamships.  
3613 A. B. Drautz. Compound engines.  
3635 Harison (F. A. Gardner & Co.) Compound steam engines.  
3640 Harison (F. A. Gardner & Co.). Governors and valve-  
gear for steam engines.  
3652 E. F. Bour. Using tide as motive power.  
3660 J. D. Hickman. Shipping rudders.  
3703 W. Brabyn. Lowering and detaching ships' boats.  
3705 R. Hollingdrake. Chilled fire bars.  
3725 R. A. Chesebrough. Propelling and steering ships.  
3747 R. S. Lawrence. Torpedo throwers.  
3797 J. Mackirdy. Supplying ships with fuel.  
3799 E. W. Toulmin. Marine engines.  
3802 C. Harriss. Compound steam engines.  
3807 C. Fox. Cut-off and reversing gear for engines.  
3809 G. M. Key. Tube stoppers.  
3825 A. Standing. Alarm for indicating the failure or  
fracture of a ship's mooring.  
3841 Boulton (A. Bauer). Adjustable cranks.  
3849 Lewis (W. E. Bauzett). Distributing oil on waves.  
3850 J. M. Paterson & T. W. Wade. Loading and unloading  
ships.  
3864 E. Lawson & H. Lea. Ships' berths.  
3902 W. Rose. Anchors.  
3910 C. J. Leaman & H. Roberts. Steam boilers.  
3981 L. Luckhart. Regulating pressure of steam.  
3952 W. Gunter. Plugs for the bottoms of boats.  
4013 R. Harnett. Hulls of boats, ships, &c.  
4055 C. Delany. Propelling boats by screw power.  
4067 R. Middleton. "Corliss" and other engines.  
4080 J. Platt. Shipping and transferring coal.  
4101 F. Crundall. Ships' signal lights.  
4159 J. & P. Braili. Cleaning ships' bottoms.  
4166 H. Edge. Life-saving apparatus and pleasure boat.  
4177 M. G. Roskell, E. Smart & F. V. Delladin. Ships'  
berths.  
4182 T. Cornelius-Knudsen. Ships' compasses.  
4230 A. Musker. Clutches for windlasses, &c.  
4243 Coelho (R. da Costa). Torpedo boats.  
4249 H. Tipping. Operating slide valves.  
4276 J. Moseley. Engine packings.  
4284 R. J. Gatling. Torpedo and gun boats.  
4342 A. Marque. Screw propellers.  
4377 J. Fielding. Shipping coal.  
4379 T. W. Hartley. Steam boiler scraper.  
4445 T. Hunt. Working engine valves.  
4446 R. G. Briggs. Pumps.  
4454 J. Fraser. Steam injectors.  
4499 J. McKirdy, S. S. Carrick & H. Binko. Rescuing persons  
from drowning.  
4500 Redfern (T. W. Mayson). Measuring distances for naval  
and other purposes.  
4502 R. Harnett. Screw propeller.  
4515 J. Dewrance and G. H. Wall. Pressure gauge tubes.  
4572 N. J. Halpine. Marine torpedoes.  
4603 R. S. Richards. Furnace grates.  
4609 C. Körte. Rotary pump.  
4623 J. Farquharson. Reflector for search lights for use on  
war ships.  
4637 R. Seabrook. Coating for ships' bottoms.

# The Marine Engineer.

LONDON, MAY 1, 1889.

A PAPER of great interest has been communicated by Mr. W. H. White, Assistant Controller of the Navy and Director of Naval Construction, to the Institution of Naval Architects. Great national interest is being taken in the development of the Navy at the present time, and the large sum of money proposed to be placed at the disposal of the Government for the immediate building of large additions to our Navy will, no doubt, be shortly an accomplished fact. Mr. White is, as we understand, in a very responsible and important position as regards the designs to be eventually adopted for the new ironclads by the Admiralty. We also understand that designs from all quarters and inventors are submitted in batches to the Board of Construction, and the chief points of seeming value are noted and reported on, and it is left to Mr. White's well known skill to suggest a design which shall comprise as many of the points of excellence of the various submitted designs as possible. Two designs have been prepared and approved by the Board, which include a combination of many important features of improvement. Both designs embody identical qualities so far as relates to the disposition of the armament; the number and calibre of the heavy guns; the nature, disposition and protection of the auxiliary armaments; the distribution and thickness of the hull armour; the propelling machinery, speed and coal supply; the complement and equipment; magazines and transport of ammunition; and arrangements for hold-stowage. In principal dimensions and displacement the types are identical. The essential differences are that while one design is for a turret ship, with moderate free-board at the extremities and with guns about 17 ft. above water; the other is for a barbette ship, with the guns carried about 6 ft. higher, and with high free-board at the bow and stern. The following principles were laid down by the Board for the new designs as regards disposition of armament: First, that four heavy guns should be placed in two protected stations, situated at a considerable distance apart, each pair of guns having an arc of training of about 260° equally divided on each side of the line of keel, all four guns to be available on each broadside. Second, that the greater portion of the auxiliary, or secondary, armament should be placed in a long,

central battery situated between the two heavy gun stations, and so disposed that there should be practically no interference with the fire of any one gun by that of any other. Third, that in view of the development of high explosives it was preferable to mount the auxiliary armament on two decks, one of them being the spar deck, rather than to carry the guns chiefly between decks. We are glad to see that these conditions show considerable foresight as to the possible development of new explosives, since there might be great risk of the principal armaments being destroyed by the explosion of a single heavy shell within the armoured enclosure were they placed too close together. Again, as such high explosives and quick-firing guns may prove very destructive weapons of offence, the distribution of the secondary armament has to be so arranged that it may be used without interference by, or danger from, the fire of the heavy guns. The size of the heavy armament guns has been defined at 67 tons, 13½-inch calibre, which was considered to have already been proved as thoroughly successful. The secondary armament will consist of ten 6-inch quick-firing guns, besides a considerable number of smaller quick-firing guns. With regard to the armour protection, a belt 8½ feet broad extends over two-thirds of the length of the vessel with a maximum thickness of 18 inches, and a 3-inch steel deck is fitted above it. The broadside above the thick belt is protected about 9½ feet above water over a considerable portion of the length by 5-inch armour. The protection of the heavy guns consists of 18-inch armour on the turrets and 17-inch armour on the redoubts protecting the turret bases. Mr. White considers that a separate redoubt system, in association with a thin side armour above the belt, is a point of importance in these new designs. The guns will be worked by the hydraulic system of mounting and working, which will render them easily handled in action. The speed to be realised in these new ironclads is expected to reach 16 knots natural draught, and 17½ knots with forced draught. This speed, Mr. White considers, is as much as may be fairly realised at a moderate expense for such heavily-built vessels as our modern ironclads, the rise from 14 to 17 knots requiring a doubling of horse-power; and it is probable that, to raise 17 knots to 20, would require again a further doubling of the power. The speeds the new vessels will possess will, it is hoped, exceed those of nearly all battle ships built or building. The coal supply does not seem to be larger in amount, but as

our coal stations are numerous in number, and, we hope, shortly will be amply protected against hostile surprises, it may be assumed that the 900 tons proposed by the Board as the supply for the new ironclads would suffice as there is an unappropriated weight of 500 tons, which may be allotted to coal if thought necessary. The new ships are to be of rather larger dimensions than former ironclads of about the same class, and on this point there is much difference of opinion as to whether new constructions should be in the direction of concentrating heavy outlays in single vessels or should be distributed over a greater number of vessels of smaller tonnage. As there is a total increase of load of about 1,000 tons as compared with the nearest examples of present first-class ironclads—the new ships are of 13,600 tons displacement, about the same as the great Italian ironclads. The increase of size, therefore, is entirely due to increase of load, for which floating power must be provided, so that Mr. White seems to consider that to fulfil the requirements of the Admiralty Board a larger tonnage than heretofore must necessarily follow. From what we can see there is great promise in the new designs, and we trust that we shall in a few years' time have seen an end to the uncertainty of our capabilities for maintaining an adequate control of the seas.

THE Italian Government seem to be successfully pursuing their views for the necessity of light-armed swift cruisers, as we learn from information communicated to the Institution of Naval Architects by P. Watts, Esq. The *Piemonte* has just been added to the Italian Navy. She is only 2,500 tons displacement and 300 ft. in length by 38-ft. beam, but she has a considerable armament of quick-firing guns and three torpedo tubes, and is capable of steaming upwards of 21 knots. One of the torpedo tubes fires directly ahead, and one on each broadside from a torpedo chamber immediately before the machinery space. The 6-in. and 4½-in. quick-firing guns are mounted upon the upper deck and are protected with steel shields for the gunners, the two foremost of the said guns being sponsoned so as to fire right ahead, and the two aftermost to fire right astern. The advantages of a quick-firing armament are being more and more generally appreciated. It adds largely to the weight of shot that the vessel is capable of delivering in a given time, the fire of each quick-firing gun being tantamount to two or three slow-firing guns of the ordinary pattern with a minimum number of

gunners and shields. Lord Armstrong has stated that the *Piemonte* will be capable of discharging against an adversary in a given time twice the weight of shot and shell that could be fired by the largest war vessel now afloat, not excluding the leviathan battle-ships of five or six times her size, which could ill withstand the torrent of shell which the *Piemonte* could pour into the large unarmoured portions of their structure. Both below and above the armour deck the ship is subdivided into a large number of watertight compartments. Each set of engines is in a separate compartment, and each pair of boilers is in a separate compartment. There are a series of watertight flats forming an inner bottom throughout the ship. The coal-bunkers are arranged along the side throughout the machinery compartment. Before and abaft the machinery spaces there are deck flats from two to three feet above the water line, the spaces between these and the armour deck forming a raft body which can be packed with patent fuel, coal, or stores, as desired. The machinery of the *Piemonte* has been constructed by Messrs. Humphreys, Tennant & Co., of Deptford, and consists of two sets of vertical triple-expansion engines. Each set has two low-pressure cylinders and therefore acts on four cranks. The cylinders are of the following dimensions: High pressure, 36 in.; intermediate, 55 in.; low pressure, 60 in.; and the stroke is 27 in. Steam is generated in four double-ended boilers, adapted for a working pressure of 155 lbs. The steam trials are now in course of being made, and with a very moderate air pressure in the stokeholds, equal to ½ in. of water, a mean speed of 20.168 knots has been developed with an indicated horse-power of 7,760. With closed stokeholds and forced draught a speed of over 21 knots has been realised. She will carry a full coal supply of 600 tons, and at 10 knots an hour, a suitable cruising speed, she can cover a distance of 13,200 knots.

As the maintenance of maximum strength with minimum weight of material is an object of the utmost importance to be attained in the construction of war ships, J. I. Thornycroft, Esq., has submitted his views upon the reduction of weight in boiler construction to the Institution of Naval Architects. Mr. Thornycroft considers, from certain experiments that have been made with a water-tube boiler, that it will evaporate more water per foot of surface than a locomotive type and work economically, whilst

the weight of the water-tube boiler and water would be less than half that of the locomotive type. The power of the water-tube boiler to get up steam in a short interval of time is also a great convenience to a war ship, as otherwise steam must be kept up continuously if there is a possibility that it may be wanted with only a short notice. There is also to the water-tube boiler the advantage of free expansion, and that their connections with the upper and lower cylinders are not exposed to the heat of the fire. This arrangement causes an apparent absence of leakage as compared with that of the locomotive type. There seems, however, to be much prejudice against the water-tube boiler, and opinions have been expressed that it will have but a short life. In such boats, however, as water-tube boilers have been supplied to, the water-tube boiler seems to retain a good character for several years, an instance being mentioned of the Congo Mission steamer *Peace*, of which a late report states that the boiler is doing splendidly. Another instance is in a second-class torpedo boat that has been working for some years, and some sample tubes cut out of the boiler are quite satisfactory. In the case of two other Spanish torpedo boats, upon examination after some two years of work, they were found to have been so neglected by the accumulation of ashes and soot around the tubes and within the casing, that it was remarkable that they had not given way and caused trouble earlier. Had the stokers attended to their duties properly in the removal of the deposits, the boilers would have been as good as ever. From careful experiments made by Professor Kennedy it appears that with natural draught the evaporative duty of this class of boilers reached 13·4 lb. of water per pound of coal from and at 212°. The efficiency of the boiler was, therefore, about 87 per cent. of the theoretical evaporation, which would appear to be altogether an exceptional result realised from lightest materials.

## THE INSTITUTION OF CIVIL ENGINEERS.

### ARMOUR FOR SHIPS.

AT the Twenty-first Ordinary Meeting of the Session, on Tuesday, the 9th of April, Sir George B. Bruce, the President, being in the chair, the Paper read was on "Armour for Ships," by Sir Nathaniel Barnaby, K.C.B.

The author described and illustrated by drawings the applications of armour to ships in the French Navy between 1858 and 1888. He directed attention to the increasing thickness of armour to meet the growth in the gun, to the corresponding reduction in the area of surface covered, and to the eventual disuse of de-armour for protecting the batteries. Thereupon

the development of quick-firing shell-guns was rapidly extended, and high explosives, such as gun-cotton, melinite, bellite, lyddite, &c., were introduced, and were being perfected as bursting charges for shells. On the assumption that thin armour was, and would remain, effective against such projectiles, armour of 4 and 5 inches in thickness was again being demanded, by sailors, for the defence of the sides of the ship in front of the batteries. Believing that such armour would be costly, ineffective, and even dangerous, and that it would tend more than ever to reduce the number of ships which could be brought into action, the author drew attention at the outset to what he conceived to be a wrong policy for this country. He observed it was certain that, apart altogether from these quick-firing guns, it would only be necessary to put up targets of thin armour, and expose them to the fire of heavy projectiles in order to show the frightful wreck, behind the target, which occurred years ago, and which led to thicker, and ever thicker armour. But there would be this difference in favour of the gun, that the projectiles were heavier and stronger, the velocities higher, and the explosives more powerful. He showed that without going beyond the ships now building, an expenditure of £1,000,000 per ship had been reached. On examining all such large ships, whether British or foreign, it would be discovered that they were most seriously exposed to the attack of the powerful weapons now in rapid course of development. The Naval authorities had to decide whether they would concur in still further enlargement in individual ships; or would endeavour rather to meet these weapons by combining the forces of smaller ships. The author considered there was no difficulty in taking the latter course, and that it had many advantages. The principle of subdivision was consistent with perfect seaworthiness, with speed as high as that of the largest ships, with the control of weapons which could be used with fatal effect upon the most powerful ships of the enemy, and with such powers of endurance as would enable the smaller vessels to receive injuries from the largest ships without necessarily fatal results. If it should be said that this dispersion of force entailed a risk of destruction in detail, by encounters with units of greater force in the hands of an enemy, that argument simply went to show that organizing skill would be required to ensure the presence of the united forces where they were needed. Referring to the concentration of material value in a few ships, thus preventing the construction of many ships, he remarked that in the line-of-battle ship of fifty years ago the value of the material for a single command was about £100,000, and the value per man in the crews of such ships not more than £150. In the ironclad of 12,000 tons of to-day, the value of ten of the former line-of-battle ships was entrusted to each captain, and not less than £2,000 to each man in the crew. In order to put forward, in a concrete form, his view as to the type of fighting ship most suitable for the present needs of the British Navy, he had brought forward a design. It was for a ship of 3,200 tons displacement, costing one-fourth of the so-called first-class battle-ship of to-day. A sufficient number of ships of this type could probably be built and armed in two years. It might be said that nothing could be done upon such dimensions, and at such cost, to entitle the ship to be called a battle-ship. But the seventy-four gun line-of-battle ship of fifty years ago had only a total displacement of 3,000 tons; and the eighty-gun ship of the same period 3,500 tons. This design came between the two, and would only cost as much as three seventy-four gun ships. If the British Government determined to spend money upon invulnerable ships, the difficulty in getting enough ships would be perpetually growing. There was no obstacle, except in finding the money, to making an invulnerable ship. Ships could be built and navigated which no torpedo, or ram, or gun that could be worked from any ship now in existence, could fatally wound. In such a ship every man might be absolutely protected, high explosives notwithstanding. But there would be so few of them that commerce and the Colonies might be lost for want of ships, and there would only be the satisfaction that the sailors had been protected in such ships as existed. The question was, ought England at the present moment to move still farther onward in increasing the size and cost of heavily-armoured ships, requiring four or five years to complete? Or, ought this country rather to endeavour to increase rapidly the number of protected ships, capable, by reason of their speed and armament, of taking part in any engagement with an enemy, however powerful? In this exposition of the uses of armour, it was apparent that fighting ships must continue to use it. When armour was employed in the

form of comparatively thin horizontal plating, experiment seemed to have shown that steel, low in carbon, was the best material. When it was employed in the form of a wall, either upright or inclined, and comparatively thick, the value of a hard face became very marked. The various modes of manufacturing thick armour for upright, or nearly upright, defences were described, and illustrations were given of the comparative resisting power of compound and of forged steel plates; also of two armour-plates of great excellence, manufactured at Sheffield, one of them compound, having a steel face and an iron back, and the other of forged steel throughout. The superiority of the compound plate was very marked. The author also drew attention to the improvement effected by the use of the hydraulic press in the manufacture of thick armour-plates. To many minds, it seemed that the hope of the future, for peaceful sea traders, lay rather in abasing than in increasing the individual superiority of the special ship of war. No efforts should be spared to raise the character and strength of the fast mercantile ships. But it must be admitted that there was no prospect of a diminution in the use of armour in regular fighting ships. The evident tendency was towards its introduction into every fighting ship. Referring to the aspect of the question from the side of the attack, the author remarked that when the large unarmoured structures in the French ships were considered, the seriousness of the new attack became evident. And it was the artillerist who must be first impressed. It was of more consequence to be able to inflict damage in action than to be able to avoid it. The best defence was to be found in a vigorous attack. It must be understood that the powerful ships in modern navies were not protected, so far as their batteries were concerned, by the armour which the French thought necessary. They were unarmoured from their lower decks upwards. The author asked: Was full advantage to be taken in the British Navy of these high explosives in any war which might break out within the next two or three years? Writing before the Government proposals had become known to him, he would agree cheerfully to any suggestions by the Government, as to the size of the new ships, and as to the use of armour for them, if they were laid for approval before some competent technical committee for a month. If the author were responsible for the steps which must be taken by the Administration, he would insist upon having the soundest independent judgment which could be obtained. He felt satisfied that if such a body as the Council of the Institution had been consulted in 1866, 1871, and 1875, when naval ordnance was in a crisis and under serious debate, it would not have happened that the question of breechloading would have been kept closed from 1866 until 1879. He believed that if such a body had been consulted in 1859, it would have appreciated better the significance of the four ironclad ships then building in France, and the Government proposals would have been wisely modified. The attitude of the engineer towards questions of war material differed from that of a member of a political administration, and from that of naval and military officers. The engineer was mainly interested in the question of the development of the powers of the weapons of war, and he was constantly thinking how they might be extended, and how the maximum of power might be got out of a given expenditure. The tendency with the Administration was to estimate the comparative value of available resources of rival Governments, and not to look beyond the immediate future. It might be seen from the speech of Sir John Pakington, when introducing the Navy Estimates, on the 25th of February, 1859, and when the French ironclad sea-going ships were being built, how easy it was to undervalue new forces. This Administration undertook the building and conversion at that time of 67 wooden line-of-battle ships and frigates; and they were all in the hands of the dockyard authorities, in various stages of production, a few months afterwards. But not one of them was suitable for the circumstances of the time. Many of them were never finished.

### INSTITUTION OF NAVAL ARCHITECTS.

THE annual meetings of the Institution of Naval Architects took place on April 10th, 11th, and 12th, in the Hall of the Society of Arts, Adelphi, under the presidency of the Earl of Ravensworth. There was a very large attendance of members, associates, and visitors, among those present were Lord Armstrong, Lord Charles Beresford, M.P., Sir James Ramsden, Admiral Sir John Hay, Admiral Sir Geoffrey Hornby, Admiral

Sir F. Nicholson, Admiral de Horsey, Admiral Sir W. Houston Stewart, Sir E. J. Reed, M.P., Sir Nathaniel Barnaby, Admiral Field, M. L. de Bussy (designer of the most important ships in the French navy), Admiral Sir E. Fanshawe, Admiral Colomb, Admiral Morant, Mr. Martell, Mr. Elgar, Mr. Carbutt, and Mr. Thornycroft.

The formal business of the institution was first transacted. Mr. George Holmes, the secretary, read the Annual Report, as follows:—

The Council is able to report with much satisfaction that the prosperity of the Institution continues to make steady progress. During the year 1888 110 new members and associates were elected; on the other hand, the losses due to death and resignation were 17, showing a net gain of 93. Thanks to the large increase in the number of the members, the finances of the Institution are in a satisfactory condition. The balances in hand at the end of the year show an increase of £155 19s. 4d., and the Library Fund has been increased by the investment of £500 in East India 3 per cent. stock. As was announced in the last report, the Council accepted a very cordial invitation from the President of the Institution of Engineers and Shipbuilders in Scotland, and from the Directors of the Clyde Steamship Owners' and Sailingship Owners' Association, to hold a summer meeting on the Banks of the Clyde. The meeting (which was the second held by the Institution in Glasgow) took place on the 24th to the 27th of July last, and, like its predecessors held at Liverpool and Newcastle-on-Tyne, proved a great success. The Institution was received with the utmost kindness and hospitality, seven papers were read at the meetings, and excursions were arranged to the Forth Bridge Works, the Glasgow Harbour and Works, the International Exhibition, the works of Messrs. William Denny Brothers, and of the Steel Co. of Scotland, and to Loch Fyne and Inverary Castle. The best thanks of the Institution are due to those who provided so well for the instruction and amusement of the members. The rules for the election of vice-presidents are under the consideration of the Council, and proposals relating thereto will be submitted at the next general meeting of the Institution. It is with much regret that the Council announces the death of one of the original founders of the Institution, Dr. Joseph Woolley, M.A., LL.D., who died on March 24th last. Dr. Woolley always took the most active interest in the affairs of the Institution. The very first paper read before the Institution at its inaugural meeting was from his pen. He was one of the original vice-presidents, and was elected an honorary member in the year 1884, as a recognition of the eminent services which he had rendered to the Science of Naval Architecture. A biographical notice of Dr. Woolley will be published in the forthcoming Volume of Transactions. The Council also regrets to announce the death of another Vice-President, Admiral the Hon. Arthur Duncombe, and of two former members of Council, viz., Sir William Pearce, Bart., M.P., who was head of the Fairfield Shipbuilding and Engineering Co., Limited, and Mr. John MacMillan, shipbuilder, of Dumbarton.

The President, in moving the adoption of the Report, delivered the following address:—

THE PRESIDENT: Gentlemen, in accordance with custom, the usual custom of this Institution, I rise with your kind permission to address a few words to you in the shape of an opening address; and, first of all, it too often falls to my lot to look at what I may call the dark side of the report, and to ask you to join with me in an expression of sympathy for those who have left our ranks at the call of Nature during the past year. I am sure you will all join with me in expressing our sincere sense of the loss we have sustained in the death of Dr. Woolley. He was one of our original members, as has been described to you in the Report, and his valuable labours will never be forgotten by the Council of this Institution, and by this Institution itself. The services which he has rendered to us will make our loss a very heavy one for us to bear, and I am sure I am only expressing your sorrow for one who has departed from amongst us. There are other three names I will mention among our losses, and they are the names of a great and personal friend of my own, the late Admiral Duncan; and the name of Sir William Pearce, who in the vigour of his age, and the full possession of those energies and abilities which raised him to so high a position in society, has been taken from us. We have to lament him and also to sympathise with his family in the loss they have sustained. There is also the name of Mr. MacMillan, well known to many of you—well known and respected by all our Scotch friends, and many of

our English friends also. I hope I am expressing your own feelings when I express my own sorrow and sympathy in these severe losses which we have sustained.

I will now, Gentlemen, turn, if you please, to what I may call the brighter side of our Report, and I am very happy to be able to congratulate you all upon our own present position and prospects as an Institution. I may also—and I do so with the utmost cordiality—congratulate you all upon more than a comparative—a very substantial—return of commercial prosperity. I think that, as a whole, our national interests—our great national industries—are in a condition of prosperity which has not been known for several years past. The tide has turned, and I hope and trust that you may all benefit, and that all the other interests which are associated with this Institution—there are many—and the great industrial interests of the country may enjoy that prosperity to the full. But there is, perhaps, no branch of national industry in which that activity, which at present is prevailing, is more marked than in the great industry of shipbuilding—and of course associated with it, the business of the marine engineer. I do not think that I am using any term of exaggeration when I say that I believe all our great shipbuilding establishments are at this moment actively engaged, and that their prospects for at least the present year are of a very favourable character. I trust that that may continue, and when we look a little forward, seeing we have in prospect a large amount of Government work, which I rejoice most cordially to think is to be largely shared in by private establishments, I think that the prospects for the future, extending considerably beyond the limits of the present year, may also be considered highly favourable. If we turn—which I will very shortly, because I do not want to trouble you with many figures to-day—to the returns of Lloyd's Register, we find that at the commencement of this year there were under construction 445 merchant steamers of an aggregate tonnage of 811,000 tons in round numbers. And this is a point that I should like to emphasise, that more than seven-eighths of that total were steamers—and steel is the material for seven-eighths of that quantity. Now, in reference to steel, I should just like to make this one remark. We have heard a good deal lately, and public opinion has been a good deal aroused and excited by certain reports which have reached us of the condition of the plates of the *Nile*, and the effect of corrosion on those plates in consequence of the paint having stripped off, and I am glad to observe that on the list of papers to be read this year there is a paper on "Corrosion" coming from a most valuable source, and perhaps nobody in the room is better qualified to deal with it than the author of that paper. I think it is a most opportune paper, and one which the country will hail with considerable satisfaction. But there is another characteristic which I having been connected all my life with the interests of the Mercantile Marine, and living in a part of the country where such a vast amount of the cargo tonnage of this country is built, wish particularly to call attention to, and I think it is not out of place that I should do so—that is the great improvement, the great progress that has been made already, and is being made, in the structural strength of our cargo steamers; and which is still more satisfactory to observe, and I make this remark especially in connection with the work of this and similar Institutions, is that these great improvements in our cargo ships are not at all the result of guesswork, or conjecture, but these improvements are being effected by careful calculations by our shipbuilders of the strains produced upon different sections of the ship at sea, and by provision begin carefully made to withstand those strains. I make that announcement with some confidence, and I think that that is a most satisfactory feature in the present building of our cargo vessels. I could confirm it by evidence, but I do not wish unnecessarily to detain you to-day, but I think that when wild and reckless statements are made from time to time about our merchant ships, that it is right and just that the efforts and energies, and the talent of our shipbuilders and shipowners should receive from time to time something like public recognition, and nobody can doubt that the work of this, and similar institutions such as exist on my own river, the Tyne, and also on the great port of Clyde, and other places, the admirable papers that are written, the difficult and complex problems that are solved, have been taken into account by our shipbuilders, and the admirable and vigilant supervision exercised by Lloyd's in the construction of our merchant vessels has borne good fruit. I say nobody can doubt that

all these circumstances are having admirable results, and therefore I am able to congratulate you upon one of the very great influences arising from the labours of this and similar Institutions in connection with the shipbuilding of the country. I think it is right that we should recognise the intelligent appreciation of our shipowners of the information so disseminated, and that a fair share of credit should be assigned to them for the success of those efforts and of that intelligence; but, Gentlemen, while our shipowners and shipbuilders are engaged in the great work of improving our Mercantile Marine, which I may say without exaggeration covers every sea, and crowds every port in the world, while these improvements are being made, and while every effort is being made to meet the wants of commerce—because we are led to hope and believe that trade is improving, not only in our own country, but in all other countries in the world—while these efforts are being exercised, still we must not forget that some of the most important and powerful maritime countries in the world are showing at this moment unusual activity in the construction of a class of vessels which are called commerce destroyers. I do not particularise, because it would be invidious to do that, but it is a very well-known fact. That word is rather an ugly word, but it has a very deep signification for us, and therefore I am quite sure the English public, the taxpayers of the country, will not grudge the efforts which are about to be made by the Admiralty, who are responsible in that particular respect to the country to perform their duty to protect our commerce. That brings me at once, Gentlemen, to ask your permission for a very few minutes to refer to the Admiralty programme which is now before the country, and to be allowed in a few sentences to notice the circumstances under which the paper, which you will see by the programme is to be read by the Director of Naval Construction to-day, will be read to you. The Admiralty programme of building for the year is a very extensive one, and it is a continuous programme, and that continuous policy has practically been already endorsed by Parliament. The paper that is going to be read to you is a paper upon the designs of the battle-ships, which are to compose what will practically be a new fleet, and a most powerful fleet when the Admiralty proposals are completed. Now I do not think that anybody will refuse to agree with me that those designs (you see them upon the walls) come before the country with very high credentials, indeed I hardly know myself what higher credentials you could expect. It was in the month of August last, I think I am correct, that the Board of Admiralty met for the purpose of considering and laying the conditions for the building of those vessels, and the Board of Admiralty had at that time before them, not only the most approved types of vessels composing Her Majesty's Navy, but they had also before them, as I understand, the most approved types of foreign ships. It was in November that the Admiralty met, and they agreed upon certain main conditions that those vessels had to fulfil. The designs were prepared by the Chief Constructor, aided by his very accomplished staff, and when I speak of the Chief Constructor, I claim no more than his due, when I say that he stands at the very head of his profession; that he enjoys the reputation of an eminent naval architect, not only in this country, but in all other countries in Europe; and that he possesses the absolute and entire confidence—and this is a much more important point for you as Englishmen—of the Board which employ him. Well, these designs have met with severe and stringent criticism. Now I am quite sure that every man in this room will agree with one that criticism is a most valuable thing, and I cannot conceive any well advised Board of Admiralty seeking otherwise than to court criticism rather than to condemn it, and I think the Admiralty have taken a very wise course, and certainly they have paid this Institution a very great compliment, in permitting a discussion upon these designs to take place within these walls. But I would like to say this—valuable as we all admit criticism to be—it is essential in the very nature of things, that if criticism is to be valuable, it should be fair, and in order to be fair there are certain leading considerations which must be kept carefully in view. The art and duty of a critic is a very difficult and a very responsible duty to perform, and it strikes me that the first point to be borne in mind is the rapid progress of science. That progress is so rapid that it is exceedingly difficult for any Board of Admiralty or any shipbuilder, private or otherwise, to follow, and it is almost absolutely impossible to keep up with it, and I think that it is in the pursuit of science that very great injustice in the past—I speak this as only my own

private opinion, and you will take it for what it is worth—has been done to the naval architect in that pursuit of science. Ships have been laid down, kept upon the stocks sometimes six, sometimes seven, and even as long as eight years, additions have been insisted upon, alterations have been required to be made which the naval architect when he designed the ship never contemplated, and by the time the ship is launched and sent to sea great changes in her draught of water, and consequently changes in the position of her belt or her side armour, however it may be distributed, have taken place. You ought not in justice to condemn the naval architect, because the ship presents a different appearance to that which he contemplated when he designed her. All I think it is fair to ask a naval architect in these days of progressive science to do is this: to take the best type of ship that exists, to have it before him, to remedy ascertained defects, and to supply deficiencies shown by experience to exist. I do not think you can do more, because if you require him to do more than that, you inevitably force him into the region of conjecture and possible speculation—not speculation in the ordinary sense of the term, but speculative ideas—the region of idea rather than the region of practice and experience, and I need not say that that is an exceedingly dangerous region to travel in. But, gentlemen, there are other considerations which I think must be kept in view, and those are the great complex combinations which a modern fighting ship is required absolutely to contain within itself. There are, first, the conditions of stability, seaworthiness, handiness, and minute subdivision. That is a pretty large combination, but it has to be made and effected. Then comes the combination of the maximum offensive and defensive power. Then comes the combination of speed, coal endurance, and the facilities (and this rather an important point, although it is not so often dealt with) for re-coaling our fighting ships when at sea, we have heard lately complaints made by naval officers that those facilities in many of our earlier ironclads do not exist. That is another combination. Then comes the combination of the distribution of the armour, and that has been greatly complicated, I apprehend, of late by the enormously-increased force of the modern explosives, and their effect not only upon the outside, but also upon the inside of ships. Then comes the distribution of the armament—the placing of the guns. That has been very much complicated by the addition of the powerful auxiliary armaments with which our fighting ships have now to be provided in the shape of the rapid-firing guns, and that involves the great difficulty, first of all, of giving the guns the proper elevation high above the deck in order to effect concentration of fire, whether upon the broadside or whether forward or aft, and then the greatest care must be taken that the fire of no one gun or set of guns interferes with that of another. Well, of course, there are many problems to be solved and provided for in our line of battle-ships which will probably be explained to you in the paper which you all are, I am sure, anxious to hear, and which I should be perfectly unjustified in detaining you any longer from hearing. I take these to be the leading combinations, and I only point them out for the purpose of my argument, namely, that all these and many other considerations must be borne in mind when anybody, however able, however competent, however experienced, undertakes to criticise the designs of our line of battle-ships. These matters, and many others, will form the subject of the paper which will be read to you to-day, and that paper I apprehend will be a reply to the criticisms that have been made of those designs, and an explanation of the purposes of those designs. All I can undertake to say—and I say it with the most complete confidence—is that that reply and those explanations will be conveyed to you in terms as clear, as candid, and as complete as the English language will admit of; it will be, gentlemen, for you, each and every one of you to judge for yourselves whether the reply is a satisfactory one, and whether the explanations given are clear and convincing. You will all have that opportunity, and therefore I leave that part of the subject. I have merely put these few points before you and I thank you very much for the kindness with which you have permitted me to do so, and I will conclude by expressing, not a hope, but a firm belief that the discussion will be a thorough, a searching, and a satisfactory discussion. That it will be conducted upon the principles—the noble principles, I may say, that always mark the debates in this hall, with that temper, that tact, and that regard for the feelings of others, even although they may happen to be our opponents,

which ever mark our discussions. But it will be necessary, gentlemen, and the Council have had this matter before them, and have made provision, as they hope, for its accomplishment in some degree, to a considerable degree, to depart from the spirit or rather the words of our rules. I wish the discussion to be a thorough discussion, and therefore, I must ask your permission in some degree—a considerable degree, probably, to relax the severity of our rules with regard to the length of speeches. But, gentlemen, I must also ask this of you that if you give me that discretion, if I think that any one speech coming from what quarter it may, rather goes beyond the bounds of moderation, it will be my duty to signify in a quiet way that you have had enough from that particular person. I shall appeal to you with confidence, but I wish in the exercise of the authority with which you vest the Chair on this and other occasions, to be allowed to exercise as far as I am able my own discretion in these matters, because it must be apparent to you all, I think, that our rules are extremely valuable rules, and when we relax them it is only on special occasions, and I need not remind you of the old saying that "the exception proves the rule." I shall appeal to you to support me if any of the circumstances which I have gently hinted at, should happen to occur. Now, I thank you, gentlemen, for your kind indulgence. Perhaps I have intruded upon you too long, but there are certain matters unconnected with the immediate subject of to-day, which I think, at any rate, should be recognised in an institution of this kind. I have ventured to dwell upon them in the fewest words I possibly could find, and as I sit down I will call upon the Chief Constructor of the Navy to read his paper.

There is one word more, gentlemen, inasmuch as we have a paper promised us from that eminent authority, Sir Nathaniel Barnaby, to-morrow, which deals specifically with the distribution of armour, any gentleman who may be pressed for time will have an opportunity on another occasion—that is to-morrow—of addressing himself to that particular feature of the question which is quite sure to be involved in Mr. White's paper. That is a loophole which, no doubt, some gentlemen may wish to avail themselves of, and it is my duty to point it out to you

## ON THE DESIGNS FOR THE NEW BATTLE SHIPS. \*

Architects, on April 10th, the Right Hon. the Earl of RAVENSWORTH, President, in the Chair.]

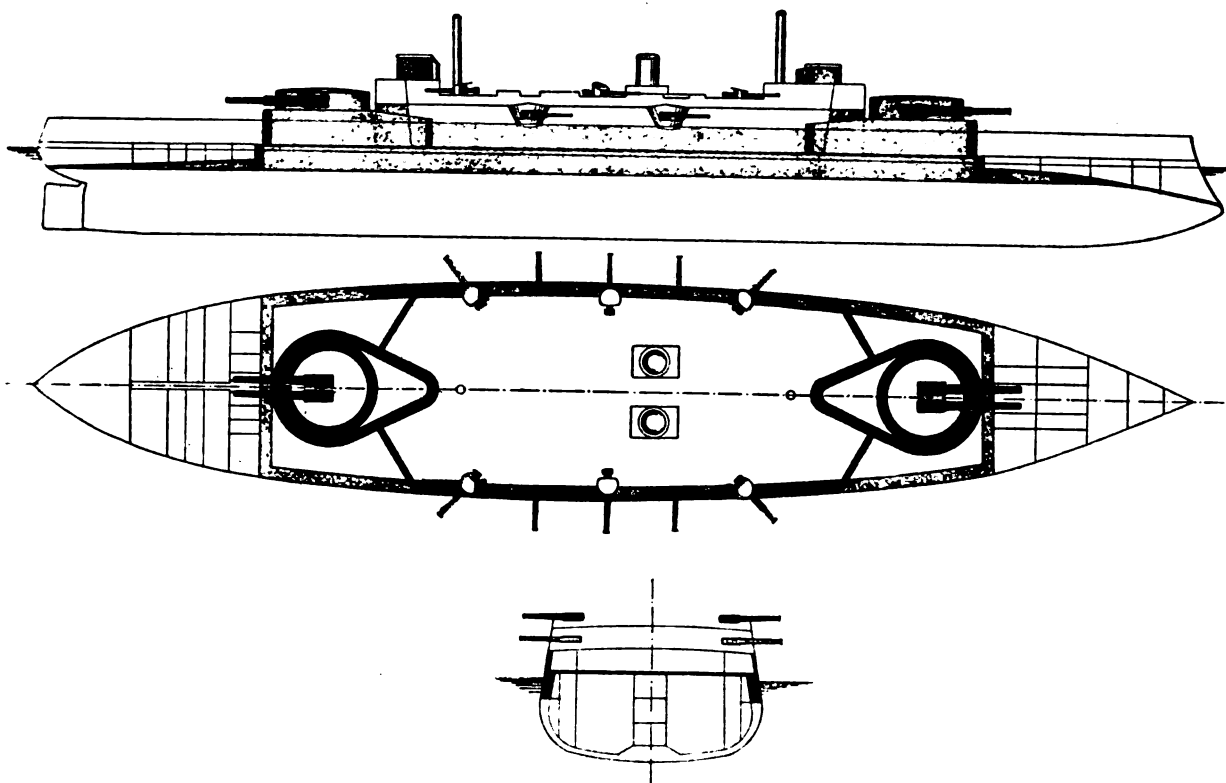
IT has been the practice in this Institution, from its commencement, to devote no inconsiderable part of the proceedings to discussions relating to war-ship construction generally, and to the Royal Navy in particular. Including among its members as it does many most eminent naval officers, as well as the leading shipbuilders and marine engineers of the world, no better opportunity can be secured for the investigation of the scientific and professional questions incidental to war-ship design. On many previous occasions members of the Institution occupying the position which I have now the honour to hold, and gentlemen occupying equally responsible positions in foreign navies, have brought forward descriptions of new types of ships, or problems arising out of their official work, and always with advantage to the public service, as well as to the Institution.

Recognising the great interest which is now being taken in the designs of the eight first-class battle-ships which are proposed to be added to the navy, and feeling convinced that no equally suitable opportunity could be obtained for replying to criticisms of the designs which have appeared in the public press, I applied for and obtained permission from the First Lord of the Admiralty to prepare this paper.

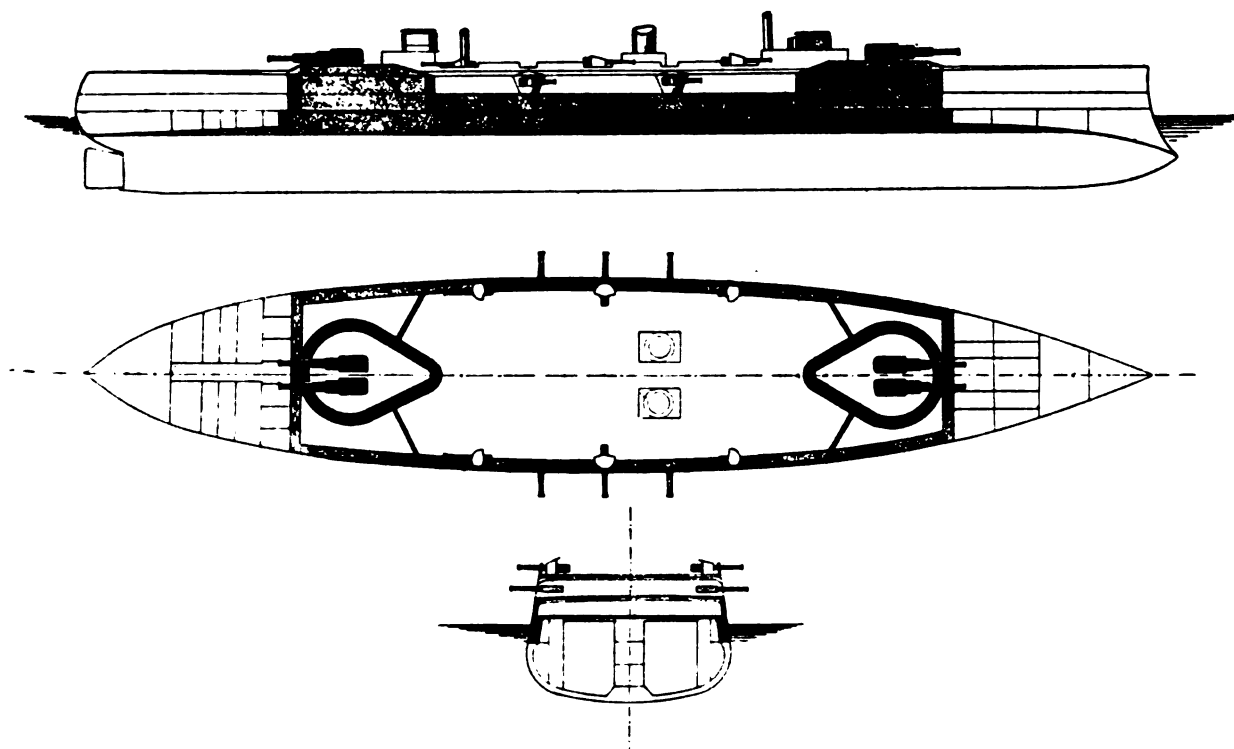
Its principal object is to describe the main features of the approved designs for these battle ships, and to contrast their protection, armament, speed, and coal endurance with the corresponding features in other battle-ships designed during the last twenty years. Incidentally it will be made clear that there are good reasons why these ships surpass in size any previously constructed vessels of the Royal Navy.

As I proceed with the description it will be my endeavour to

\* Read at the Thirtieth Session of the Institute of Naval Architects, on April 10th, the Right Hon. the Earl of RAVENSWORTH, President, in the Chair.



NEW TURRET SHIP DESIGN, FIG. 1.



NEW BARBETTE SHIP DESIGN.—FIG. 2.

deal as fairly and candidly as possible with the adverse criticisms which have been launched against certain features of the designs, and to show that they are not well founded. In doing this I shall treat chiefly of matters of fact, and as to matters of opinion shall describe the reasons which led to the decisions embodied in the designs. On these matters of opinion we shall probably hear much more in the discussion which will ensue.

The "action taken by the Board of Admiralty with regard to the preparation of designs" for these battle-ships is fully described in Parliamentary Paper C 5,635 of 1889; and a general description of the designs appears in the "Statement of the First Lord of the Admiralty explanatory of the Navy Estimates 1889-90 (C 5,648)." I need not reproduce the particulars of the procedure followed, but it may be safely said that no designs prepared at the Admiralty or elsewhere have ever received more thorough and careful consideration by competent authorities.

The choice eventually made by the Board was made from amongst a considerable number of alternative designs, and in full view of the most recent types constructed, or in course of construction, for the Royal Navy and for foreign navies. Before coming to a decision, the First Lord convened a meeting, attended not merely by the members of the Board, but by a number of most distinguished and experienced naval officers. At this meeting were discussed *seriatim* the several features that should be embodied in the design of a first-class battle-ship—speed, disposition and nature of armament, distribution of armour, protection of heavy guns, freeboard, &c. On each of these points the opinions of the officers present were ascertained. Subsequently the Board issued instructions as to the designs which were to be worked out in detail with a view to building the eight ships contemplated in the programme.

Two designs have been prepared and approved by the Board. In both designs are embodied identical qualities; so far as relates to the disposition (in plan) of the armament; the number and calibre of the heavy guns; the nature, disposition, and protection of the auxiliary armament; the distribution and thickness of the hull armour; the propelling machinery, speed and coal supply; the complement and equipment; magazines and transport of ammunition; and arrangements for hold-storage. In principal dimensions and displacement the two types are identical. The essential differences are that while one design is for a turret-ship with moderate freeboard at the extremities, and with guns about 17 ft. above water, the other is for a barbette ship with the guns carried about 6 ft. higher, and with high freeboard at the bow and stern.

It will be convenient to preface a description of the designs by the consideration of the *disposition of the armament*; a matter of the highest importance, which necessarily exercised great influence upon other features of the design, including (as will be shown hereafter) the distribution of the armour.

#### ALTERNATIVE DISPOSITIONS OF ARMAMENT.

The Board took into consideration all the principal dispositions of armament adopted in recent years for battle-ships, as well as several proposals that have been made—some of which have been patented—but not yet carried out in practice. It may be of interest and assistance in the discussion if I briefly summarise and illustrate some of the more important of these arrangements; and for this purpose a series of diagrams (Figs. 3—17) have been prepared. On these diagrams the arrangement of the armour is also indicated.

Fig. 3 shows the disposition of the armament of the *Sultan* designed in 1868. Practically the whole of the armament is contained in a central two-storied battery placed amidships, and associated with a water-line belt of armour. Other illustrations of the "belt and battery" system need not be given, as it is well known.

Figs. 4 and 5 show respectively the arrangements carried out in the "breastwork monitors," *Devastation* and *Thunderer*, designed in 1869 and proposed for the *Fury* in 1870. Here a low freeboard is adopted for the greater part of the length; and the two turrets, each containing two guns, are placed at the ends of the armoured breastwork, which is of less breadth than the ship. This design for the *Fury* was cancelled, and work upon the ship stopped at an early stage. The vessel was entirely redesigned in 1872 (see Mr. Barnaby's Paper in *Transactions* for 1872) the *Dreadnought*, which is illus-

trated in Fig. 6. In all these designs the disposition of the armament is identical; and in securing the "all round fire" of the turret guns it was made practically impossible to carry any effective secondary armament.

Fig. 7 shows the *Inflexible*; a central citadel ship with turrets placed *en echelon*. In some of the later ships of this type an endeavour has been made to carry a few 6 in. guns, as well as light quick-firers on the superstructures; but, as in the previous disposition, the means taken to secure large arcs of command for the heavy guns reduced greatly the efficiency of the secondary armament. Fig. 8 illustrates the arrangements of the Italian citadel-turret ships *Duilio* and *Dandolo*; and Fig. 9 those of the German citadel-barbette ships of the *Sachsen* class.

During the period 1869-78 very little was done in the designs of H.M. ships in the direction of providing for a numerous and effective secondary armament; but this was not true in foreign navies, and particularly in the French Navy.

Figs. 10 and 11 show the principal features in the disposition of armament in a large proportion of French battle ships. There are four protected stations, each containing a heavy gun with a large arc of training. At a lower level are placed a number of guns of moderate calibre, sheltered to some extent from the fire of the heavy guns by the deck. A very similar arrangement to Fig. 11 has been adopted in the *Imperieuse* and *Warspite* of the Royal Navy, where considerable experience has been gained of its practical working.

Another typical disposition of the armament is illustrated by Fig. 12, which represents broadly the arrangements adopted in the Italian battle ships *Italia* and *Lepanto*. Here the four heavy guns are carried *en barbette*, high above water, at the ends of a single-armoured enclosure placed near the middle of the length of the ship; nearly the whole upper deck forming a glacis, over which these guns fire if the full arcs of training are obtained. The auxiliary armament is chiefly carried on the main deck, and sheltered by the upper deck from the fire of the heavy guns.

It will be remembered that in the design for an American battle ship, described by Mr. John in a paper read before the Institution last year, a somewhat similar disposition of the armoured battery or citadel was adopted, but in association with turrets, and with a different arrangement of the auxiliary armament and upper works.

Fig. 13 represents the Russian battle ship *Catherine II*. In this case the battery is of large extent, and at each of the corners pairs of heavy guns are mounted *en barbette*, on the disappearing principle. The upper deck is a glacis for their fire, and the auxiliary armament is placed below this deck.

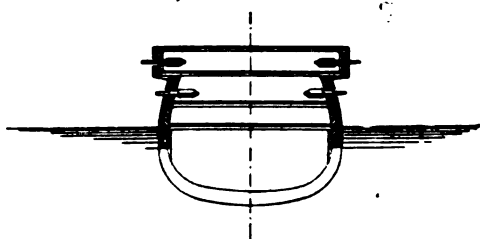
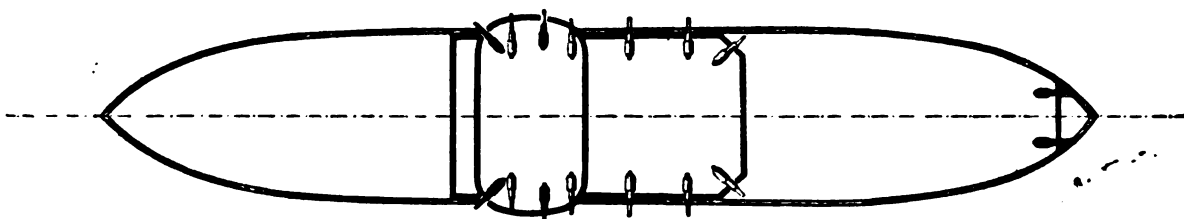
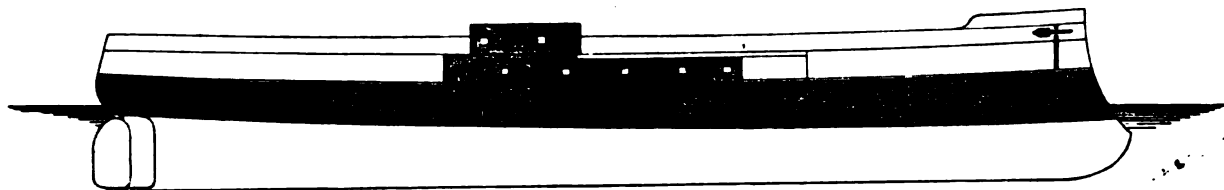
Fig. 14 represents the disposition of armament in the *Admiral* class. Here the secondary armament is greatly developed and mainly carried in a central battery between the two protected stations containing the four heavy guns.

Fig. 15 illustrates the very similar arrangements (in plan) adopted in the *Nile* and *Trafalgar*. It will be seen that in these vessels the central battery is shorter, and the secondary armament less powerful, than in the *Admirals*.

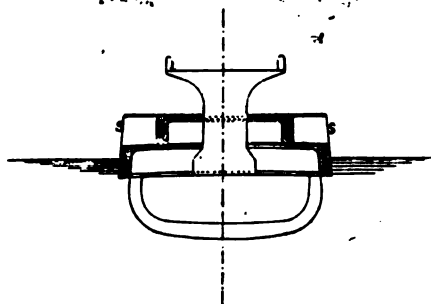
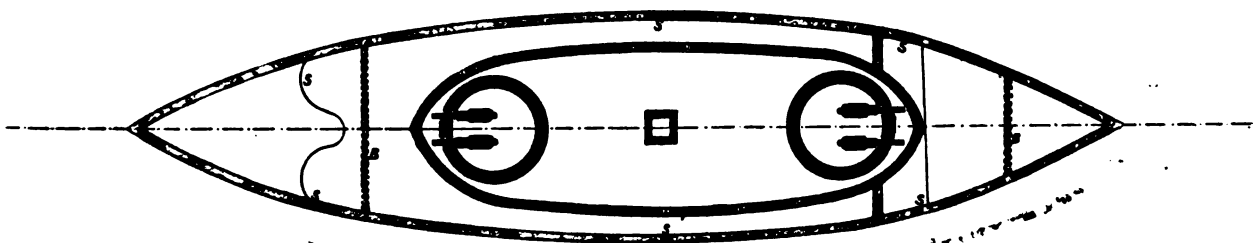
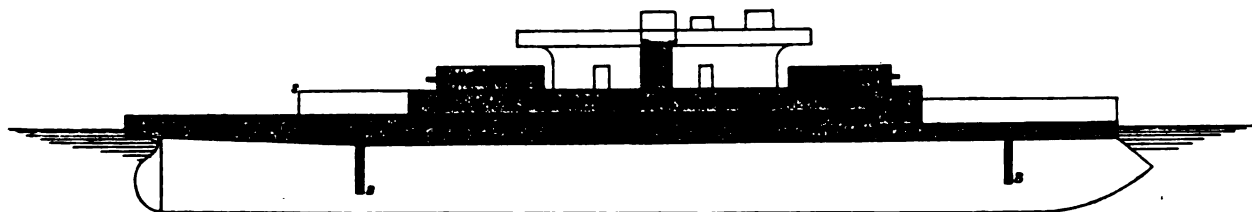
Fig. 16 illustrates one of the various arrangements proposed by Sir Edward Reed, under his patent (No. 12,479, of 1887), but not adopted, I believe, in any ship yet built.

Fig. 17 illustrates a patented arrangement of Sir N. Barnaby's (No. 7,759, of 1888) for securing in ships of relatively small size "an all-round fire from a single position, the guns being armour-piercing, and the armour defending them being as thick as that usually employed for the defence of the emplacements of heavy guns in large battle ships." The diagrams given in the patent specifications do not indicate the disposition of the armour in an actual ship, but, as it is explained that the funnel is to come up through the centre of the platform carrying the guns, it is obvious that the armoured tower must be placed near the centre of the length of the ship, and that practically the whole of the upper deck must be treated as a glacis over which the guns must fire. So that any auxiliary armament which might be carried would have to be placed below this upper deck. There are other features in the plan in relation to protection, buoyancy, and stability to which it is unnecessary to make any reference in this connection.

It will be understood that for the present purpose I am dealing only with these various dispositions of armament *in plan*, and am not discussing the very important question of *heights of guns above water*, to which reference will be made hereafter, as well as to the arrangements of armour plating indicated on the diagrams.



"SULTAN."—FIG. 3.



"DEVASTATION."—FIG. 4.

"A" is a bulkhead from breastwork to ship's side. "B B" are bulkheads added during construction.  
 "S S S" is superstructure added during construction.

## DISPOSITION OF ARMAMENT IN NEW DESIGNS.

After careful consideration of these and other alternative arrangements, the Board laid down the following principles for the new designs:—

"(1) That there should be four heavy guns placed in two protected stations, situated at a considerable distance apart, each pair of guns having an arc of training of about 260 degs., equally divided on each side of the line of keel. All four of these guns to be available on each broadside.

"(2) That the greater portion of the auxiliary (or secondary) armament should be placed in a long central battery, situated between the two heavy gun stations, and so disposed that there should be practically no interference with the fire of any one gun by that of any other.

"(3) That in view of the development of high explosives, it was desirable to secure the widest possible distribution of the guns in the auxiliary armament; and that it was preferable to mount the auxiliary armament on two decks, one of them being the spar deck, rather than to carry the guns chiefly between decks."

The reason for this decision will be found in the Parliamentary Papers above mentioned. It may be well, however, to briefly summarise the most important points of the discussion.

Under modern conditions, with quick-firing guns and high explosives in rapid development, it is essential to provide every battle-ship with a numerous, powerful, and well-placed auxiliary armament, in addition to her heavy guns. The disposition of the armament must be such that, while giving great command to the heavy guns, their fire shall not interfere with, or be dangerous to, the lighter guns and their crews. Provision must be made, in fact, for the safe and simultaneous working of all the guns, under the excitement of action, when precautions, which may answer fairly well at drill, cannot be certainly enforced.

Reviewing all the dispositions that have been adopted or proposed, it was seen that the disposition illustrated in the *Admiral* and *Trafalgar* classes was superior to all others in the fulfilment of these essential conditions, and it had other advantages.

Experience in the *Imperieuse* had shown that the system of distributing the heavy guns in several armoured positions involved a considerable interference with the efficiency and power of independent action of the auxiliary armament. Moreover the multiplication of protected positions for the heavy guns involves a considerable additional weight of armour for a given thickness as compared with what suffices for the defence of a less number of stations each containing two guns.

On the other hand, the principle of concentration pushed to an extreme has serious disadvantages and drawbacks, although it enables greater thicknesses of armour to be used within any fixed limit of weight, since it reduces the area to be protected. These objections were considered to outweigh the advantages, and are stated in the Parliamentary Papers as follow:—

(1) The great risk of the principal armaments being placed *hors de combat* by the explosion of a single heavy shell within or under the armoured enclosure.

(2) The enormous difficulties which this disposition of the main armament introduces into the efficient working of a powerful and numerous auxiliary armament.

Experience gained with the vessels of the *Admiral* class has as yet been limited, but it has confirmed the good opinion formed at the stage of design as to the merits of the disposition of the armament; and, so far as I am informed, the general feeling amongst gunnery officers in the service is that the system is best adapted for modern requirements. We may anticipate that on this point the discussion will afford the Institution an opportunity of hearing the opinions of naval officers.

I will only add a suggestive fact, mentioned in the Parliamentary Papers:—"In some of the most important foreign navies, where one or other of these modes of disposing the armament had been adopted, and the principles either of extreme distribution or of relative concentration had been carried out, the latest designs had contained arrangements similar to those decided upon as best for future battle-ships in the Royal Navy, which disposition is also to be found re- an) in vessels like the *Trafalgar*, and in the

ments in the turret and barbette designs are practically identical. The barbette ship, being of higher freeboard at the extremities, can carry a few more 6-pounders, quick-firers; and her heavy guns are, as before stated, 6 ft. higher. But in plan the dispositions are the same, and the secondary armament in the central battery identical.

## NUMBER AND CALIBRE OF HEAVY GUNS.

It has been decided that each ship shall carry four 13½-in. 67-ton guns as the principal armament, with hydraulic apparatus for training, elevating, and loading the guns. The grounds for this decision are stated as follows:—

"There was a considerable weight of opinion that a 12-in. gun of modern design, and of about 50 tons in weight, might be made, which would possess sufficient power for most purposes; but as no such gun was in existence, and as guns of 75 tons in weight were carried in existing foreign ships, while the 67-ton 13½-in. gun was thoroughly successful, and all the details of the ammunition and mounting had been settled; it was generally agreed, that for the three leading battle-ships, 67-ton guns were to be preferred for the heavy armament."

This decision has since been applied to all the ships.

In the number and power of their heavy guns the new ships will, therefore, stand on the same footing as the *Nile* and *Trafalgar*, or the four vessels of the *Admiral* class—*Rodney*, *Howe*, *Anson*, and *Camperdown*.

The height of the turret guns above water in the *Trafalgar* as designed was 15 ft.; in the new turret ship it will be 17 ft. With the thick armour used for the protection of the turrets and turret bases, this apparently small change in the height of the guns above water involves an additional weight exceeding 150 tons.

In the barbette ships the heavy guns will be 23 ft. above water.

## AUXILIARY ARMAMENTS IN THE NEW SHIPS.

While the heavy gun armament is practically identical with that of preceding ships, the auxiliary armament is of unprecedented weight and power. In the Tabular Statement the facts are set out, but I must add some remarks, as there has been serious misunderstanding on this matter.

For example, in a letter published in *The Times*, of March 22nd, Sir Edward Reed, in comparing the new designs with the *Trafalgar*, said:—"There is a small increase in the minor armament. . . . The increase of minor armaments is too small to dwell upon in this connection."

I will endeavour to show how mistaken is the view thus publicly expressed.

As designed, the *Nile* and *Trafalgar* were to carry eight 5-in. guns, besides a considerable number of small quick-firing guns and boat guns. The total weight of this auxiliary armament was a little less than 140 tons. A very short central battery sufficed to contain this armament.

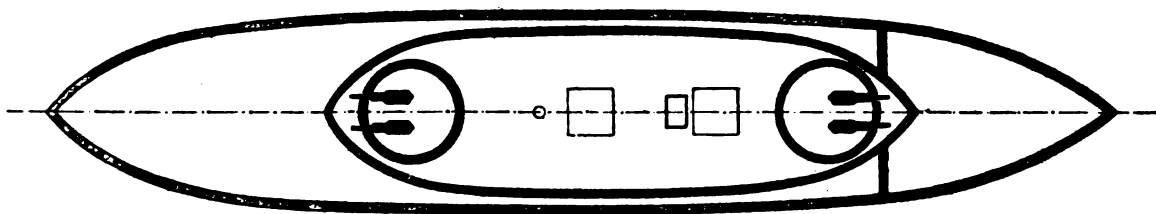
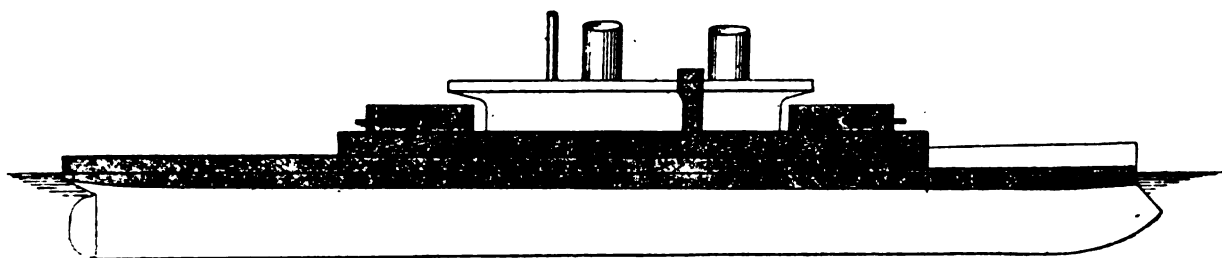
During construction, six 4.7-in. 45-pounder quick-firing guns have been substituted for the eight 5-in. guns. This reduction in the number of guns has been accompanied, however, by an increase in the total weight to about 185 tons, the Service regulations providing for a very large supply of ammunition for quick-firing guns.

Turning to the new battle ships, it will be seen that they are each to carry ten 6-in. 100-pounders, besides a considerable number of smaller quick-firers. The 6-in. quick-firing gun is still in the experimental stage; it will be adopted in these ships if successfully worked out, and weight has been taken for it. So far as weights are concerned, these ten 6-in. guns, with their mountings and ammunition, represent no less than 20 guns of the same calibre, with the allowance of ammunition hitherto carried.

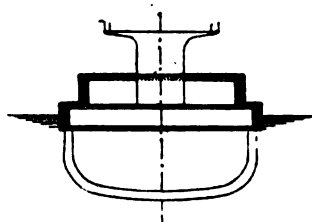
The total weight of the auxiliary armament in the new ships is about 500 tons, or considerably over three times the weight originally assigned to the corresponding armament in *Trafalgar*, and two and two-third times as great as the weight of auxiliary armament to be actually carried by that ship.

I may fairly claim that such an increase is not properly described as "small" or "too small to dwell upon." On the contrary, to provide for it has proved one of the principal problems in the design. And those familiar with war-ship construction will know well that in stopping short, as I have done, at a comparison of weights of guns, mountings, and ammunition in the two designs, I have greatly under-stated my case. For example, to accommodate this auxiliary armament a central battery has to be provided about 170 ft. in length,

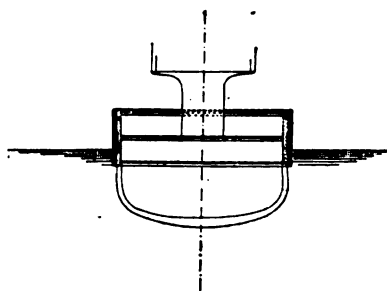
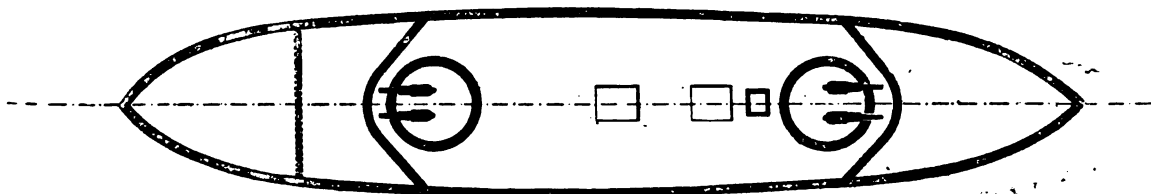
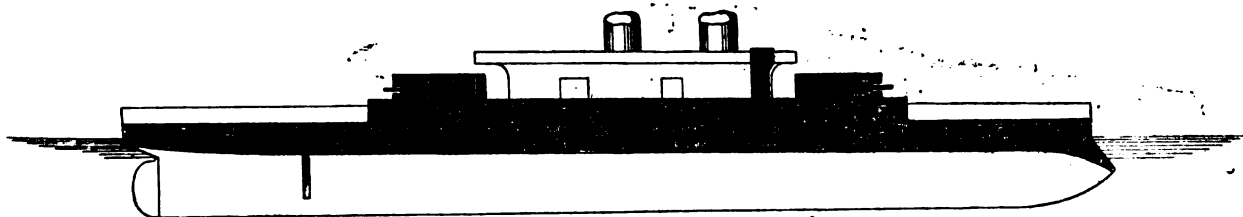
as 1 and 2, and to the tabular statement, it the disposition and character of the arma-



42.



"FURY,"—FIG. 5.



whereas in the *Trafalgar* the central battery is not quite 110 ft. in length. The more numerous and powerful 6-in. guns, of course, require considerable additional weights to be worked into magazines, armament fittings, gun supports, &c. And with this increase in armament there has necessarily been associated an increase in complement of over 100 men, as compared with the *Trafalgar*, together with the weights for provisions, stores, and accommodation corresponding thereto. Were these extra weights, which are inevitable when the auxiliary armament is accepted, totalled up, the result would constitute a very large addition to the already large excess which the new ships have to carry.

To members of this Institution I need hardly add that such an addition to the load to be carried at a given speed, and on a fixed draught of water, must involve an increase in the size of the ship, very sensibly exceeding the mere increase in load.

Before leaving this part of my subject, I would call attention to the fact (apparent in the tabular statement) that the weight of the auxiliary armament in the new battle-ships is practically equal to the total weight of armament proposed for the *Fury* design in 1870, the latter ship being of nearly 10,500 tons displacement.

I would also make the following extract from the Parliamentary Papers, although it is not possible for me to give any details at present:—

"A liberal allowance of weight has been made (in the design) for the protection of the guns, and the guns' crews, as well as for the rapid transport of the ammunition, and its protection in all the stages of its passage from the magazines to the guns."

#### ARMOUR PROTECTION OF NEW TURRET SHIP DESIGN.

This cannot be better described than by the following extract from the First Lord's statement to Parliament.

"The armour protection of the hull proper includes two principal features:—

"(1) A belt, 8½ ft. broad, extending over two-thirds of the length of the vessel, and having a maximum thickness of 18 in. armour. Transverse armoured bulkheads complete the belt, a 3 in. steel deck is fitted above it, and a strong protective under-water deck completes the protection before and abaft the belt.

"(2) The broadside above the thick belt is protected, to a height of about 9½ ft. above water over a considerable portion of the length, by 5-in. armour. Screen bulkheads similarly armoured enclose the central battery.

"The protection of the heavy guns consists of 18-in. armour on the turrets, and 17-in. on the redoubts protecting the turret-bases, &c."

The diagrams in Fig. 1 will make this description clearer. It will be seen that each turret stands in a separate battery or redoubt, which rests upon the protective deck, and is strongly armoured for the defence of the turret bases and loading apparatus. This system has been previously carried out in the *Victoria* and *Sans Pareil*, in each of which there is only one turret.

The belt armour rises 3 ft. above water and extends 5½ ft. below water. Its longitudinal extent is sufficient to ensure that if the spaces before and abaft it and above the under-water protective deck were flooded, very small "sinkage" and very moderate "change of trim" would ensue. The maximum thickness of the belt armour is 18 in., as against a maximum of 20 in. in the *Trafalgar*; the minimum thickness at the ends of the belt is the same as in *Trafalgar*—14 in. The proportion of the length protected by the belt is the same in both cases.

Above this thick armour belt and protective deck, the broadside is armoured with 5-in. steel for a length of 145 ft. and to the height of the upper deck amidships (9½ ft. above water). Oblique-armoured bulkheads or screens extend across the protective deck, and meet the redoubt armour: thus completely enclosing a lightly-armoured citadel with its top at the level of the upper deck (9½ ft. above water) having the same extreme length as the central battery, viz., 170 ft. Within the 5-in. steel armour on the sides coal-bunkers are built, extending from the belt to the upper deck, and having an athwartship thickness of 10½ ft. When filled with coal these bunkers would greatly reinforce the defence; when empty the minimum defence is 5 in. of steel, which is proof against all the smaller natures of quick-firing guns, and against many of the most destructive forms of attack from much larger guns.

"*Trafalgar*" (as illustrated by Fig. 15) the two "turrets" ends of a long armoured citadel extending to the

full breadth of the ship; with vertical armour on the sides (varying in thickness from 16 to 18 in.) rising to a height of about 11 ft. above water" according to the original design. In the completed ship this height will be about 10 ft. The upper deck over the citadel is plated with 3-in. steel. The distance between the centres of the two turrets is about 150 ft.; and the central battery between the two turrets (as already stated) has an extreme length of less than 110 ft. and a length along the broadside of about 65 ft.

In the new turret ship it has been necessary to provide a much longer central battery (about 170 ft. in extreme length) to accommodate the more numerous and powerful guns in the auxiliary armament; and the turrets are placed about 200 ft. apart. Consequently, if the citadel system embodied in the *Trafalgar* had been repeated, the length of the thickly-armoured sides would necessarily have been considerably increased; and a great additional weight and cost of armour, &c., would have been incurred if the same thicknesses had been maintained; or a considerable thinning of the armour, &c., made necessary if the same total weight had been adhered to.

No point in the new designs received more careful consideration than this. In order to elucidate the matter, alternative designs were prepared for ships of the same displacement, identical in all respects, except as regards the adoption of the "citadel" or the "separated redoubt" systems. Some of these designs are described in the Parliamentary Papers; I will briefly note one instructive comparison.

Two outline designs were prepared—one closely approximating to the turret-ship proposed to be built, the other for a ship of the same dimensions and displacement, but with a continuous citadel. The same total weight was allowed in both designs for the protection above the belt armour—on the sides, round the turret-bases, and on the turrets. Except as regards the adoption of (1) a citadel, or (2) of redoubt and thin-side armour, the ships were absolutely identical.

In the citadel ship, with the fixed total weight for protection, the thicknesses of armour found to be practicable were:—On turrets, 15 in.; on citadel in wake of turrets, 14 in.; on sides of citadel (rising to 11 ft. above water), 12 in.

In the other design the practicable thicknesses were: On turrets, 18 in.; on redoubts (protecting turret bases), 17 in.; on broadside (rising to about 10 ft. above water), and on "screen bulkheads" (completing this thin armour across the ship), 4 in. to 5 in. That is to say, the latter design gave 3 in. greater protection to the stations of the heavy guns, at the cost of reducing the thickness of armour on the sides from 12 in. to 5 in., and lowering it about 1 ft. In the redoubt arrangement the 3-in. steel deck (as already explained) was situated at the level of the upper edge of the belt (3 ft. above water), and in the citadel arrangement, at the top of the citadel armour (about 11 ft. above water).

These and other facts having been placed before the naval officers attending the meeting convened by the First Lord, the following decisions were arrived at:—

"(a) That it was preferable to have two separate strongly protected stations for the four heavy guns, rather than to have a single citadel.

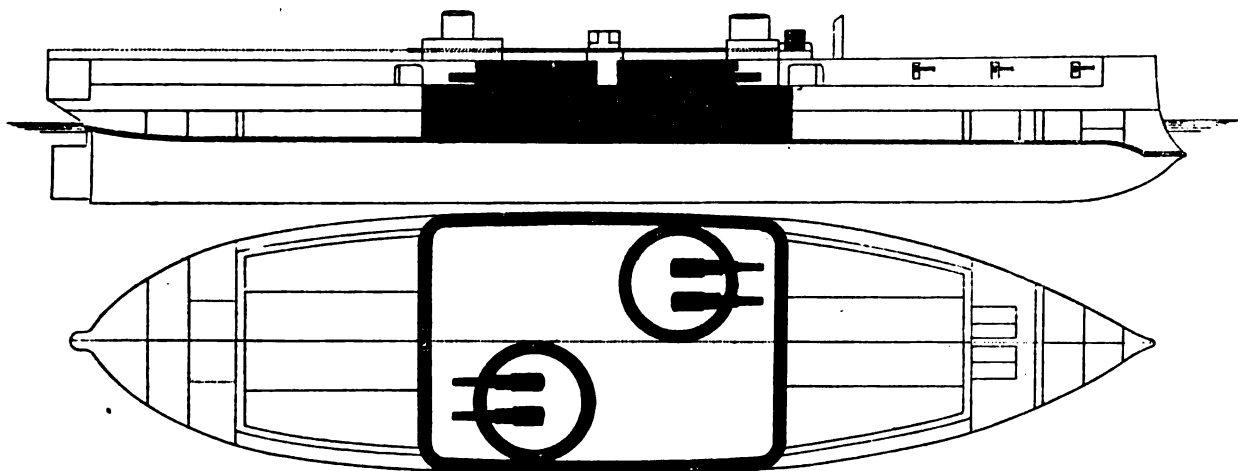
"(b) That on the whole the 4-in. armour amidships, from the belt deck to the main deck, associated as it would be with the internal coal bunkers, subdivided into numerous compartments, might be considered satisfactory; but that if armour weight became available, it could be profitably utilised in thickening the 4-in. steel above the middle portion of the belt."

I would draw particular attention to the first of these conclusions, since it expresses a most important distinction between the two systems of protection.

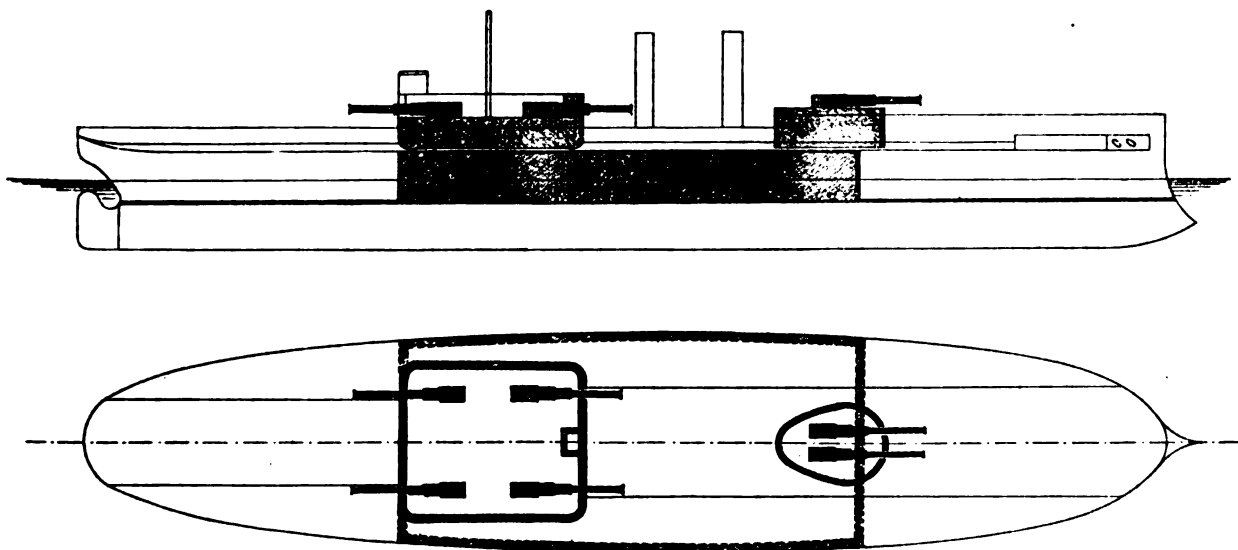
With separate redoubts, placed far apart, the two stations are isolated, and there is practically no risk of *simultaneous disablement* by the explosion of shells, or perforation of projectiles from the heaviest guns. Each redoubt offers a small target to the fire of an enemy, and its weakest part—the thick steel protective plating on the top—is of so small extent, that the chance of its being struck is extremely remote. Serious damage to the unarmoured turret bases, therefore, involves the perforation of the thick vertical armour on the redoubts.

With a single citadel, extending the full breadth of a ship, the case is widely different.

Over a comparatively large area of the protective deck-plating in the neighbourhood of each turret, perforation of the deck, or its disruption by shell explosions at any point, involves very serious risk of damage to the turret bases and the loading apparatus. In fact, such damage may be effected and the heavy



"INFLEXIBLE. --FIG. 7.



"SACHSEN" CLASS.—FIG. 8.

guns put out of action while the thick vertical armour on the citadel is uninjured. Moreover, as the turrets stand at the ends of a single citadel, there is a possibility of their simultaneous disablement by the explosion of heavy shells within the citadel.

This last risk may be minimised (as in the *Nile* and *Trafalgar*) by constructing armoured "traverses" within the citadel; but it cannot be wholly overcome, so long as both turrets stand in one armoured enclosure.

It may be thought that the risk of damage to a 3-in. steel deck situated 11 ft. above water is remote; but I think the facts are as stated, when actions at sea are taken into account.

For example, if a ship of 70 to 75 ft. beam is rolling only to ten degrees from the vertical, which is by no means a heavy roll, she presents a target having a vertical (projected) height of 13 to 14 ft. to an enemy's fire, and even if she is a steady, slow-moving ship, she will do this four or five times in each minute.

Now, at this angle of inclination, assuming the flight of projectiles to be practically horizontal, even the thickest protective steel decks yet fitted in battle-ships are liable to serious damage from the fire of guns of moderate calibre, and this danger is increased by the employment of high explosives. Of course I do not mean to say that this damage is to follow from fire intentionally aimed at the protective deck; but with a great and sustained volume of fire, such as is possible with a powerful auxiliary armament, and especially with quick-firing guns, it is obvious that there is a very real danger of chance shots injuring seriously the wide expanse of the protective deck at the top of a long citadel.

Again, it must be noted that the chances of damage to a deck placed 10 or 11 ft. above water, and with large exposed surfaces in the neighbourhood of the turrets when a ship is inclined or rolling, are greater far than those of a deck 7 or 8 ft. lower, and with 5-in. armour on the sides protecting the deck from the direct impact of shells containing heavy bursters. It is for the naval gunner to estimate these chances of injury; but, unless I am greatly mistaken, their verdict will be that a far greater number of shots are likely to strike at a height of 8 to 10 ft. above water than at a height of 4 to 5 ft.

These considerations I submit amply justify the selection of the separate redoubt system, in association with the thin side armour above the belt, and the lowering of the protective deck to the top of the belt in the new designs.

It may be urged that, if the redoubt system be adopted, it should be associated with side armour and screen bulkheads of greater thickness than 5-in. steel, and more strongly backed. This is perfectly practicable, but necessarily costly, involving an additional load of armour, and a corresponding increase in the size of the ship.

The Board of Admiralty, and the officers called into council, had in their possession, when considering this question, the most recent and complete experimental data obtained by firing against the *Resistance*, with guns of various calibres (including quick-frers), projectiles of all patterns, and explosives of different kinds.

With this information in their possession, the Admiralty pronounce the thin armour above the belt to be "satisfactory," and give effect to that decision in the designs. Sir Edward Reed, in his letters to the *Times* and elsewhere, challenges this decision, and uses very strong language in its condemnation, but, so far as I am aware, he can have no experimental data to go upon, and his objections seem to rest on purely hypothetical assumptions of what kind and extent of damage is likely to happen to a ship, lightly armoured above the belt, when she comes under the fire of an enemy's guns.

Apart from any expression of personal opinion, I would submit that it is for the naval architect to prepare alternative plans, showing possible dispositions of the protective material, within the limits of weight available in a design. Having done this, it is not his province, but that of naval officers, to determine from their knowledge of gunnery, what are the nature and extent of the damages likely to be done in action, and to choose that disposition of the armour which they consider has the balance of advantage. This is the course which has been followed by the Admiralty in dealing with the disposition of the armour on the new designs.

From passages occurring in Sir Edward Reed's letters and elsewhere, it seems that he doubts whether the First Lord and his advisers, who made the selection, understood what they were doing. I have it to these gentlemen to answer for themselves, and necessary; and anyone who will read my Papers will be able to judge whether

any answer is required. I think that none is needed on the face of the published documents.

It is, I believe, a fair statement of Sir Edward Reed's views to say that his chief objection to the proposed arrangement of armour in the new designs, as compared with the *Trafalgar*, is that the thick armour on the side rises only 3 ft. above water, instead of 11 ft. as designed for the *Trafalgar*, and about 10 ft. as completed. He speaks of "stripping a wall of armour 8 ft. high off the sides of the proposed battle-ships;" although in another place he is good enough to admit that the 5-in. armour which rises 9½ ft. above water is better than nothing, but it is a miserably inefficient substitute for the 18-inch armour, which (as compared with the *Nile* and *Trafalgar*) has been stripped off. And yet, again, he says:—"These ships are in principle, in so far as the defensive armour of the hull is concerned, neither more nor less than ships of the universally condemned *Admiral* class."

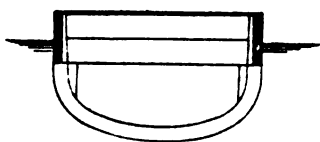
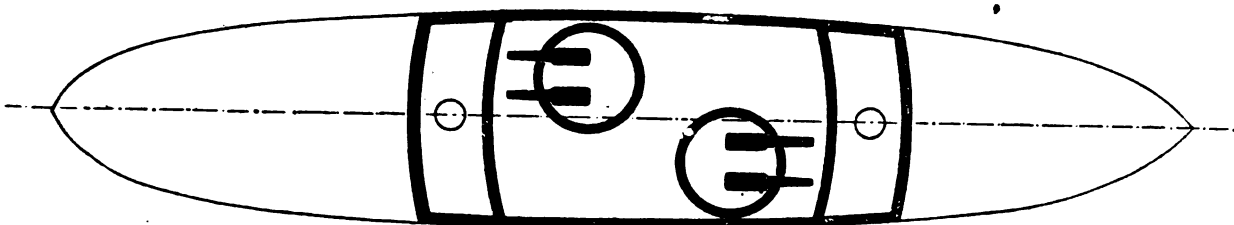
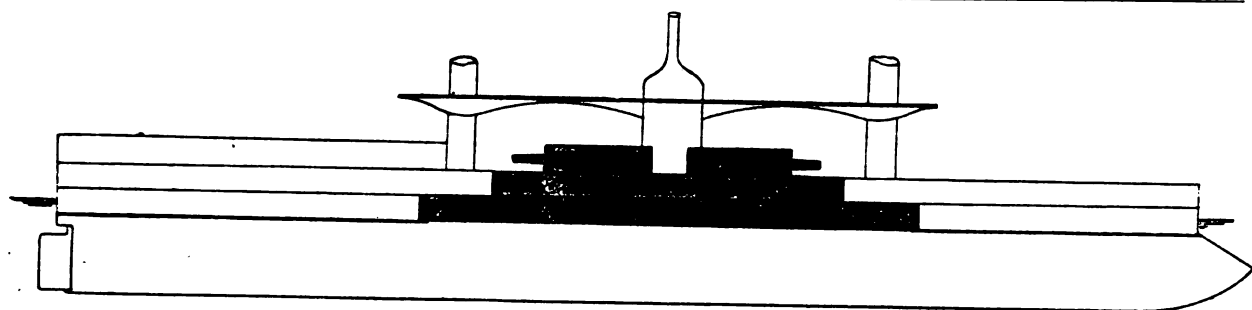
Taking the last statement first, I wish to challenge its accuracy, and to point out the essential differences between the *Admiral* class and the new designs, in the matter of "the defensive armour of the hull." In the *Admiral's* the thick armour of the belt extends over about 40 to 45 per cent. of the length, as against 66 per cent. in the new ships. Above the belt in the *Admiral's* cellular sides, extensive subdivision and coal form the only protection; in the new ships these arrangements are supplemented by the long, lightly-armoured citadel above described, and the broadside is made secure against all the smaller natures of quick-firing guns, as well as against many of the most destructive projectiles from much larger guns, to a height of 9½ ft. above water—practically to the same height as the thick armour goes in the completed *Trafalgar*, and over as great a length amidships. Surely these are differences of the highest importance. They involve a very large expenditure of weight and money in new ships, as compared with the *Admiral's*, and add greatly to the defence. Yet they are practically ignored by Sir Edward Reed, whose condemnation of the proposed arrangements has regard almost exclusively to the fact that the thick armour is to rise only 3 ft. above water.

He objects to the adoption of narrow water-line belts of thick armour in battle-ships generally, although I understand him to favour the use of such belts in cruisers. His contention, shortly stated, is that with such narrow belts there is a great risk that the damages done to the sides above the belt in action will speedily cause the ships to become unstable (in the transverse sense) and to reach a dangerous condition.

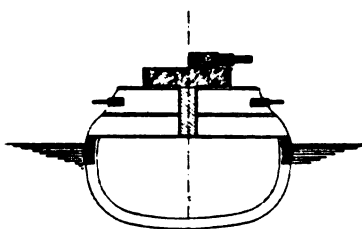
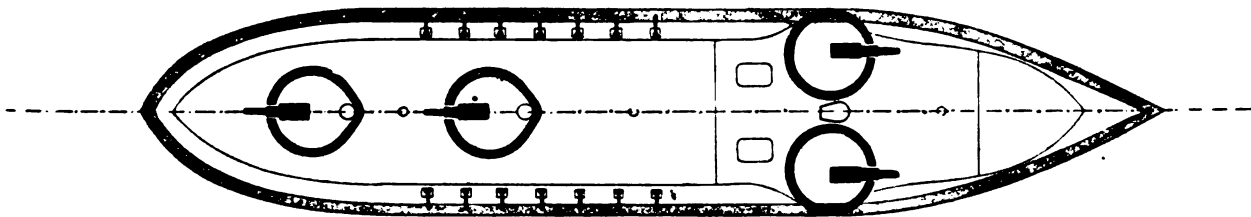
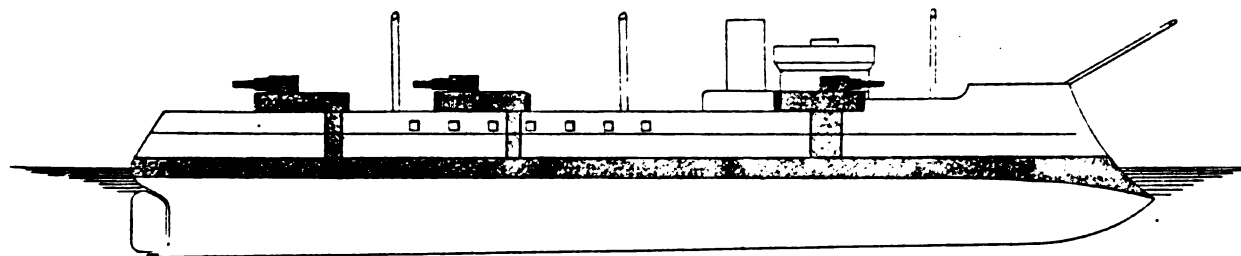
Now, clearly this is a matter which turns chiefly, if not solely, upon the estimate that may be formed of the damage likely to be done in action. It is not a question of an abstruse nature, involving elaborate and scientific calculations of stability. Everyone can see that if a ship originally of high freeboard, carrying great weights of armament and armour aloft, could be brought down, by the rapid and wholesale destruction of her upper works, to a virtual freeboard of two to three feet (the height of the thick armour belt above water), while those great weights of guns and armour, &c., still remained aloft, she would reach a dangerous condition, and would be readily capsized. On this point there can be no difference of opinion. Moreover (as I pointed out several years ago in a published correspondence with Sir Edward Reed), this element of danger, if it really exists, is not sensibly affected by carrying the narrow belt throughout the length instead of stopping short of the extremities.

Here then lies the pith of the whole question. Are such extensive damages likely to be done in action, and to be of a character that will virtually throw open to the sea the portions of the ships lying above the narrow armour belts? Is it to be regarded as impossible to keep ships thus armoured from capsizing under fire? What has been the general verdict of naval authorities on this matter, as evidenced in ships actually built?

Reference to the diagrams already used in connection with the dispositions of armament gives the answers to these questions. It will be seen that in the recent battle-ships of nearly all foreign navies belts of thick armour as narrow as, or narrower than, those condemned by Sir Edward Reed have been and are being adopted. Up to date, in most foreign ships, these narrow belts have not been associated with as effective a cellular construction of the side as is possessed by the *Admiral's* and other belted ships of the Royal Navy. Nor has coal protection been similarly cared for and made possible at the sides above the belts. Much less has there been provision hitherto



"DUILIO" AND DANDOLO."—FIG. 9.



"ADMIRAL DUFRERE."—FIG. 10.

in foreign ships of lightly-armoured citadels above the belt, such as are proposed for the new ships. It is true that many of these foreign ships have belts going to the bow and stern; but that fact does not affect our present discussion, and it may be assumed, from what has been done and is doing abroad, that naval and professional authorities there, as well as at home, do not share the apprehensions expressed by Sir Edward Reed. By common consent his estimate of the serious risks inevitable with narrow belts is not endorsed.

On this page I give a tabular statement showing the character of the water-line protection in a number of British and foreign ships, and the vertical distances to which the armour is carried above and below the designed load water-line.

It is perfectly obvious from this table that so far as the belt proper is concerned, the new ships are on practically the same footing as recent ships built in this country and abroad. But, I must repeat that, they have above the belt a lightly-armoured side, which most foreign ships have not. They are to be armoured, in fact, to 9½ ft. above water, as against 2½ to 3 ft. in most foreign ships; the total depth of armoured side is to be 15 ft., as against 7½ to 8½ ft. in some of the largest foreign ships. Relatively to those ships, therefore, the new designs clearly occupy a good position; and that is the true test.

In passing it will be noted from the diagrams that narrow belts have in nearly all cases been associated with dispositions of armaments placing the guns and their armour protection high above water and far apart.

I do not desire to enter into any lengthy explanation of the reasons which have led to this general adoption of narrow armour belts. Probably the chief reason is to be found in the fact that from the outset the depth to which armour has been carried below water has been very moderate.

	Armour as Designed.		Beam of Ship.
	Depth of Belt below Load Water-Line.	Height of Thick Side Armour above Load Water-Line.	
	ft. in.	ft. in.	ft. in.
Bellerophon .. .. .	6 0	5 6	56 0
Hercules .. .. .	6 0	8 6	59 0
Devastation .. .. .	5 0	(4' 2" amidships and aft; 6' forward)	62 3
Fury (design cancelled) ..	5 0	4' 2" amidships; 6' forward.	62 3
Dreadnought .. .. .	5 6	(11' 0" amidships; 8' 0" before and abaft citadel)	63 10
Inflexible .. .. .	6 0 (7' 0" at fighting draught)	9 8 (8' 8" at fighting draught)	75 0
Trafalgar .. .. .	5 6	(11' 0" amidships; 8' 0" before and abaft citadel)	73 0
New Designs .. .. .	5 6	3 0	75 0
Admiral Duperre ) Admiral Baudin ) Magenta Class )	5 6 5 8 4 10	2 6 3 0 2 6	67 0 70 0 66 0
Sinope Class (Russian) ..	5 0	(11' 0" amidships; 3' 0" before and abaft base of battery)	69 0
Italia & Lepanto (Italian)	Armoured deck at side is 6 ft. below water as designed		74 0
Duilio and Dandolo ..	6 0	(10' 0" amidships; 2' 0" before and abaft base of citadel)	65 0

In recent years this depth has been somewhat diminished, as will be seen from the table, both absolutely and in relation to the beam of ships. Of course, it may be argued that the depth of armour below water ought to have been increased as

ships become larger and broader. That is a separate question, and just now we are concerned chiefly with matters of fact, and with comparisons of our ships with foreign ships. As a matter of fact, armour protection goes to a moderate depth below water in all cases. Consequently, it is quite possible, and in fact quite common for the lower edge of the armour to be *emerged*, either by a very moderate inclination of the ship, or by her motion through still water, or by the movement of waves along her sides, or by her rolling in a seaway; as well as by many possible combinations of these circumstances. This emergence of the armour involves the exposure of the unprotected bottom, and chance shots entering below the armour may destroy the ship, and inevitably will cause damage that must be practically irremediable under the circumstances of action, and must result in the entry of large quantities of water into the vessel, even though she may be kept afloat by her water-tight subdivisions.

The unarmoured under-water portions of the sides and bottoms of war-ships are, moreover, exposed to serious damage in action by submarine torpedoes and by ramming; but it is unnecessary to dwell on the point.

Contrast with these undoubted risks, the risks involved in damage to the sides immediately above the armour belt, and also above the normal water-line. The consequences are clearly not so serious in many respects. Something may be done towards stopping or limiting the inflow of water when the damage is done above water. There is no head of water to deal with, as when the bottom below the armour is broken through. The projectiles which enter have opposed to them the protective deck at the top of the belt, and must pass through or seriously damage it before any of the vitals (boilers, engines, magazines, &c.) are attacked. And in the new ships (as already explained) projectiles must pass through the light armour before they can reach most portions of that deck—an immense advantage when high explosives are used.

Given, therefore, armour reaching to a moderate depth below water, a narrow belt is not such an unreasonable mode of protection as has been assumed, and the almost universal practice of adopting it is seen to have some justification.

I will only add one remark, which I feel disposed to apologise for, although it expresses a truth often overlooked in these discussions, viz., that the integrity of the unarmoured portions of a ship's bottom lying below the armour, is as essential to the maintenance of her stability as the integrity of the sides above the armour belt. Yet it is no exaggeration to say that very frequently, when the gravest fears are expressed of what may result from damage to the out-of-water portions of ships, it is virtually assumed that the parts under water, when floating in still water, are not liable to injury in action. Such assumptions are clearly inadmissible.

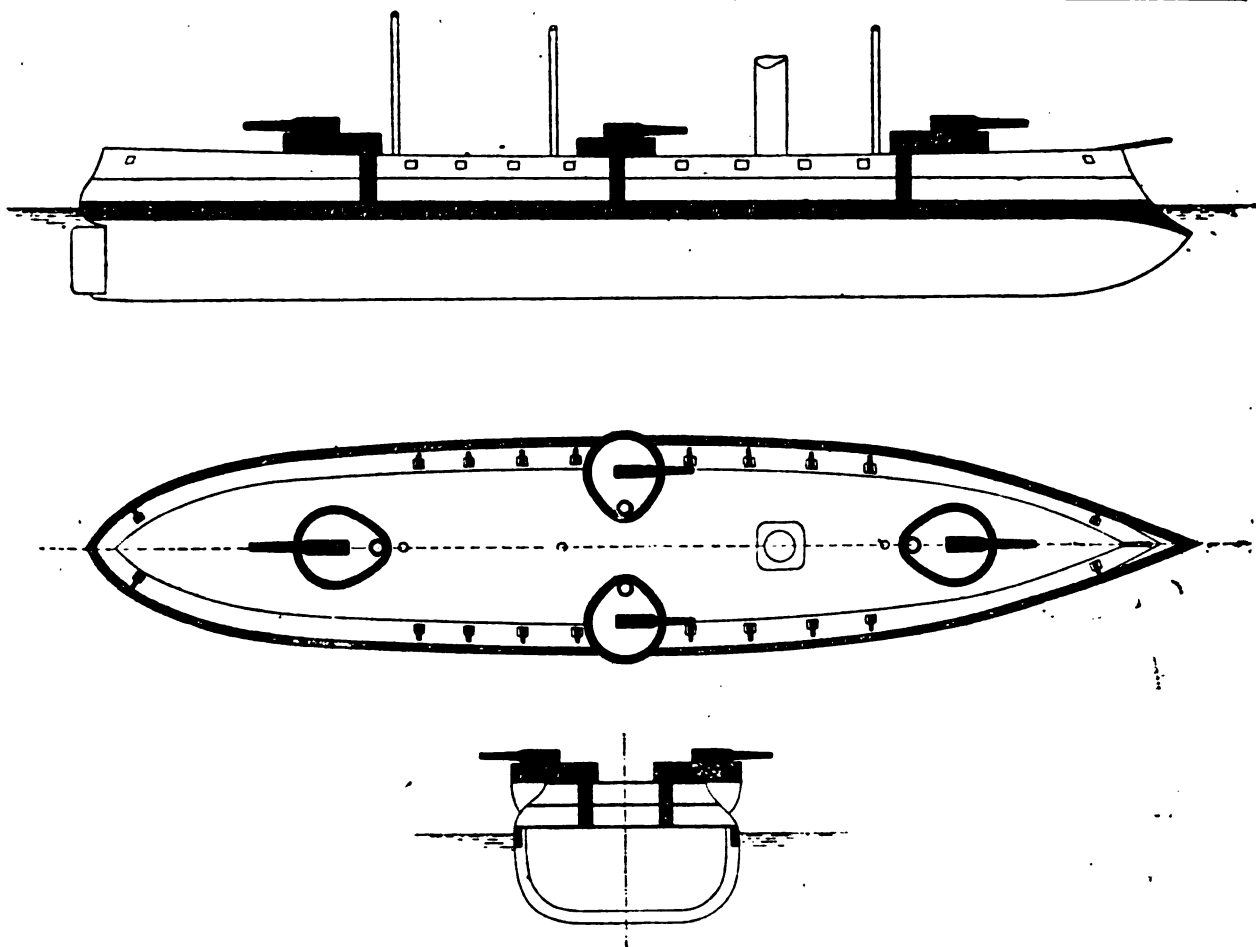
This naturally leads me to deal with one illustration, avowedly couched "in simple language," which Sir Edward Reed has put before the public lately.

In his letter to *The Times*, above quoted, it is stated that the Nile could list over to about 17 degs. "before the top edge of the armour disappeared beneath the water;" while not a hint is given in any language, "simple" or otherwise, that under this assumed condition, the lower edge of armour on the other side of the ship would be about 5½ ft. out of the water, leaving 5½ ft. of unarmoured bottom exposed.

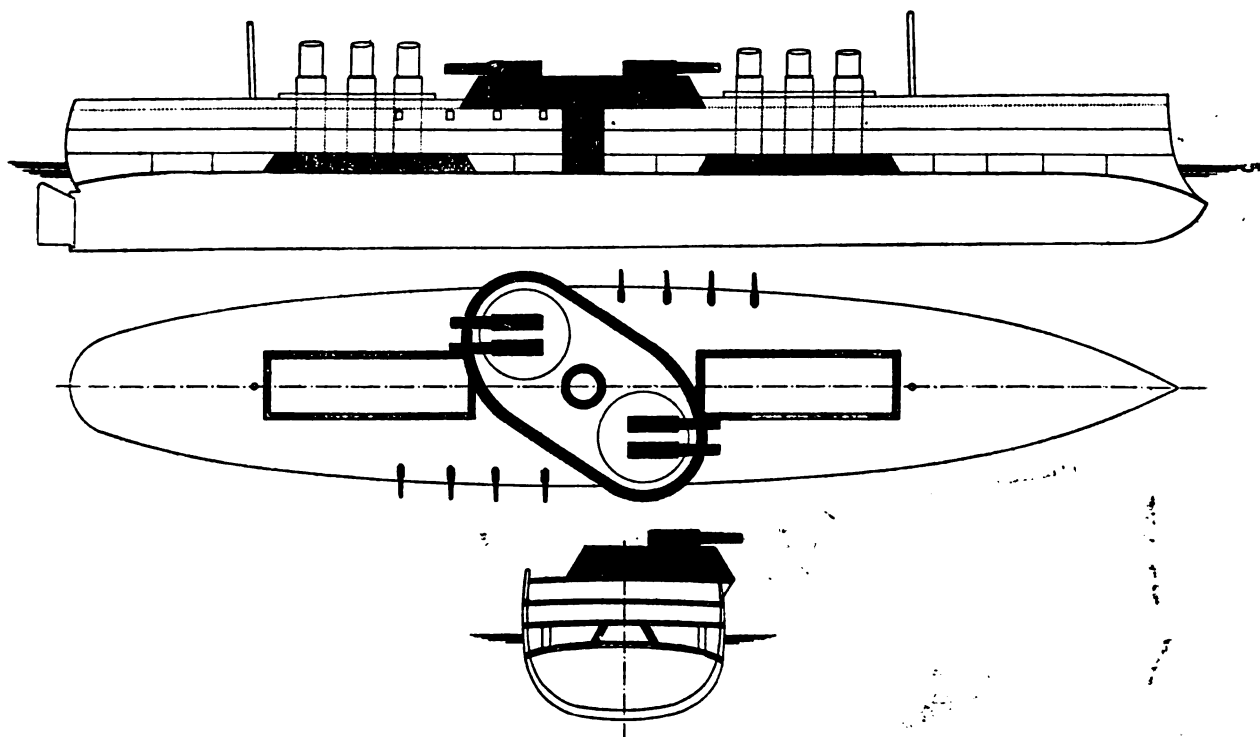
Other examples might be given of the one great fact apparent throughout Sir Edward Reed's utterances on this question of armour protection, viz., that there is no general or comprehensive survey and proportioning of the many risks that have to be encountered in action, but a restriction of the discussion to one, and that, by common consent, not the greatest risk.

Throughout his treatment of the new designs practically no regard is bestowed upon their "offensive" powers, and one might fairly say that the discussion proceeds as if the new ships were to be built chiefly with a view to make them efficient locomotive floating targets, capable of withstanding the effects of gun fire, and not capable of inflicting as well as receiving damage. To mention the point seems to me sufficient, without dwelling upon the incompleteness of this mode of treatment. In short, at least equal regard must be had to the provision of powers of offence as well as of defence in the determination of that compromise which, under existing conditions, is the best disposal of the available capital in displacement and cost of any new type of war ship.

Having made these general statements, I now wish to record my opinion that, in his haste to condemn the system of protection in the new designs, Sir Edward Reed has altogether failed



"MAGENTA," CLASS.—FIG. 11.



"ITALIA" AND "LEPANTO."—FIG. 12.

to appreciate what would be involved in giving effect to his views.

I have shown that he has not recognised the great development of the auxiliary armament, and the influence of that development on the design generally; I have indicated the practical impossibility of effectively working that armament without placing it in a long central battery, and have pointed out the fact that, with the citadel system and this long central battery, a very great increase in weight of armour, as well as size and cost of ship, must result.

Hereafter I shall deal with Sir Edward Reed's remarks on the supposed extravagant displacement of the new designs.

But for the moment, I simply wish to inquire if Sir Edward Reed, before writing in the terms he has employed, made any estimate of the increase in size and cost which would be inevitable, if the same qualities, the same kind and disposition of armament, the same speed and coal endurance, were obtained in a vessel armoured as he suggests.

Of course Sir Edward Reed may consider that the armament is wrong in its character or badly disposed, and he may have had in his mind some ideal plan that, in his judgment, would be more satisfactory. If that be the case, he does not say so in his published letters or speeches, and the omission is to be regretted. But if he should have had such an alternative in his mind, then it must be stated that the issue as to armour protection is confused by introducing such modifications into the comparison. Moreover, it will not be universally admitted that on such questions as are involved in the character and disposition of armaments for battle-ships, the views of Sir Edward Reed are to be accepted in preference to those of the Admiralty and its naval advisers.

#### DESCRIPTION OF THE BARBETTE DESIGN.

Although the foregoing descriptions have dealt chiefly with the turret ship design for a first-class battle-ship, in order that a comparison might be made step by step with the *Nile* and *Trafalgar*, it is proposed to build only one such ship out of the eight ships to be laid down.

This action is described as follows in the Parliamentary Papers:—

"BARBETTES" versus "TURRETS."—"The advantages and disadvantages of both systems having been reviewed, it was agreed (in view of the vessels existing in foreign navies or now under construction) that the barbettes arrangement in design (c) was to be preferred in a battle-ship intended for general sea-going purposes. Sir Arthur Hood recommended that of the ships proposed to be laid down in 1889-90, in the dockyards, one should be on the turret system."

I will now proceed to summarise the chief points of difference between the designs (see Figs. 1 and 2), to some of which allusion has already been made.

In the barbettes ships the freeboard at the ends is increased to 18 ft., or 6½ ft. more than the freeboard in the turret ship, and about 7 ft. 4 in. more than in the *Trafalgar* as completed.

The heavy guns are carried 23 ft. above water, as against 17 ft. in the new turret ship, and about 15 ft. as designed, or 14 ft. as completed, in the *Trafalgar*.

It is unnecessary for me to dwell upon the great advantages that should result from these changes in the power of maintaining speed and fighting guns in a seaway.

In the Royal Navy a very large proportion of our most recent and powerful ships are of moderate freeboard, carrying their guns only 12 to 14 ft. above water; whereas in foreign navies, in recent years, the heavy guns are chiefly carried from 22 to 28 ft. above water, and the freeboard is high.

The decision of the Admiralty to largely adopt the barbettes design is avowedly based on these facts, and arrived at with a full knowledge of the relative advantages and disadvantages of the turret and barbettes systems, after considering designs for turret ships with guns placed at equal height above water, and with the same freeboard as the barbettes ship.

It will be obvious that the increase in height of freeboard and of guns above water can only be secured by means of additional hull-weights, and re-arrangements of the armour. What has been done is this: the turrets have been abolished, and the weight of armour, &c., is utilised in adding to the height of the redoubts in which the turret bases stand. The barbettes thus formed are strongly armoured from the 3-in. protective deck above the belt upwards, and are divided into two storeys. In the upper storey stand the turntables carrying the heavy guns,

in the lower storey will be placed the turning engines and other important portions of the equipment.

In most barbettes ships hitherto built, whether English or foreign, the barbettes have been shallow armoured cylinders with plated bottoms, standing on light steel structures at a considerable height above the belt deck. Armoured tubes have been fitted to protect the ammunition when it has passed up from the magazines into the barbettes.

This system greatly economises weight of armour, but the development of high explosives makes it possible that shells containing bursting charges of great energy might be exploded immediately under the floors of the barbettes. Consequently it has been decided in the new ships to adopt the alternative system, above described, although it involves a very large expenditure of weight and cost on armour.

The hydraulic system of mounting, working, and loading the 67-ton barbettes guns to be carried out in the new ships will resemble closely that already successfully adopted in the *Admiral* class.

As regards the disposition of the belt armour, protective deck, and 5-in. armour, as well as the protection of the auxiliary armaments, the barbettes ships are identical with the turret design, already described.

#### SPEED.

It was originally contemplated to adhere in the new designs to the speed that had been first accepted for the *Trafalgar*, viz., 15 knots on the measured mile, with natural draught, and 16½ knots with forced draught. In working out the designs, it has been found possible to increase these speeds to about 16 knots natural draught, and 17½ knots with forced draught.

These estimates of speed are, of course, based upon model experiments made in the Admiralty establishment at Haslar, by Mr. R. E. Froude, and upon our analysis of the results of speed trials of recent ships. It was with some surprise, therefore, that I found this estimate questioned by Sir E. Reed in the following passage, in his letter published in *The Times*, of March 22nd:—

"There is a slight alleged increase of speed, half a knot. This assumed increase of speed is, however, fallacious, because, as a matter of fact, the *Nile* and *Trafalgar*, having 12,000-horse power to drive 12,000 tons of ship will obviously have the advantage in speed of ships which have but 13,000-horse power to drive 14,000 tons of ship."

This kind of criticism is so extremely popular in its form that I am almost disposed to apologise to the Institution for explaining why we may reasonably anticipate a higher speed in the new ships, apart from the practical certitude obtained by means of the model experiments and trials of other ships.

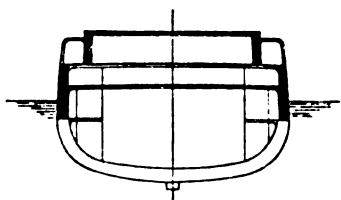
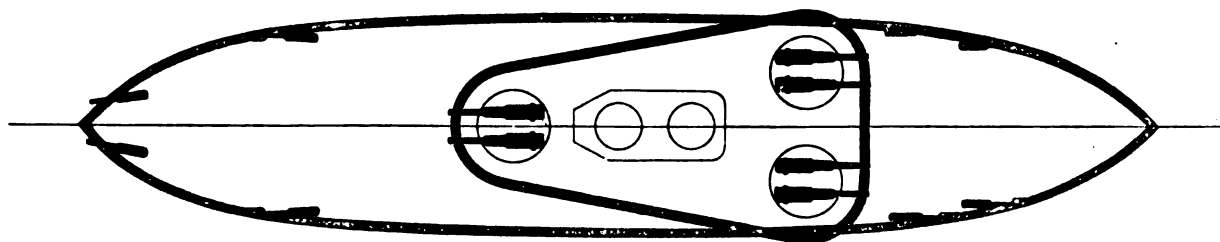
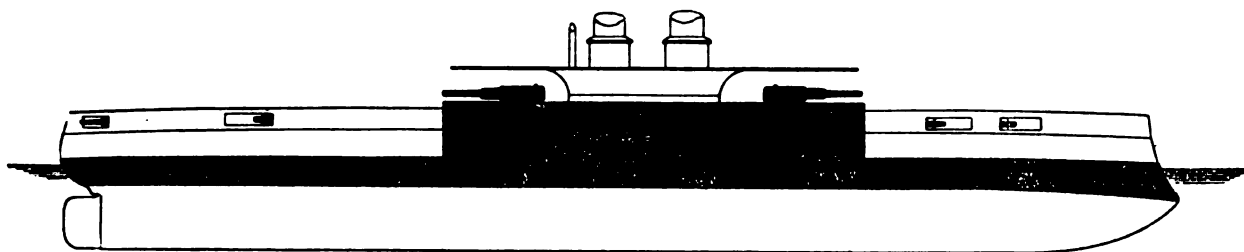
The new ships are to be 380 ft. in length, as compared with 345 ft. for the *Trafalgar*. They will be 14,150 tons displacement, as against 12,000 for the *Trafalgar* as designed, and 12,500 tons for that ship as completed. Our model experiments show that, for speeds from 10 knots up to 16 knots, the resistances of the two forms are, for all practical purposes, equal; the greater length of the new ships compensating for their greater displacement.

But at speeds higher than 16 knots the longer form begins to gain sensibly on the *Trafalgar*, and at 17 knots the *Trafalgar* form would require about 12 per cent. greater power than the new ships. At 17½ knots the *Trafalgar* form, if it could be driven, would require at least 30 per cent. greater power than the heavier but longer ships. Now this speed of 17½ knots is what is estimated as the maximum (forced draught) performance with 13,000-horse power in the new ships; while with 9,000-horse power (natural draught) we hope to reach about 16 knots.

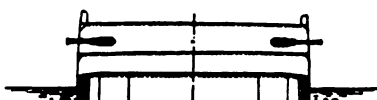
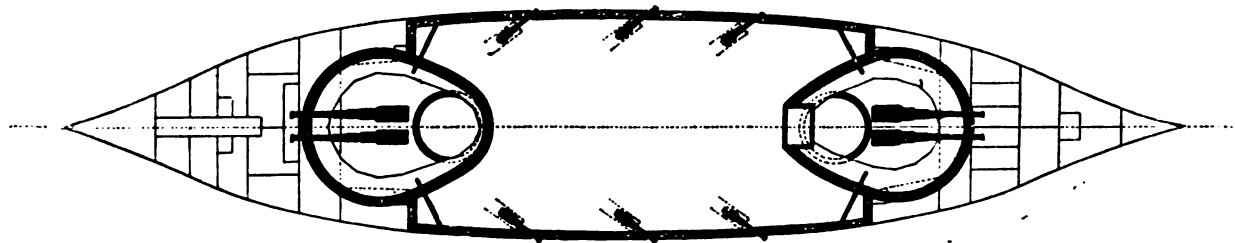
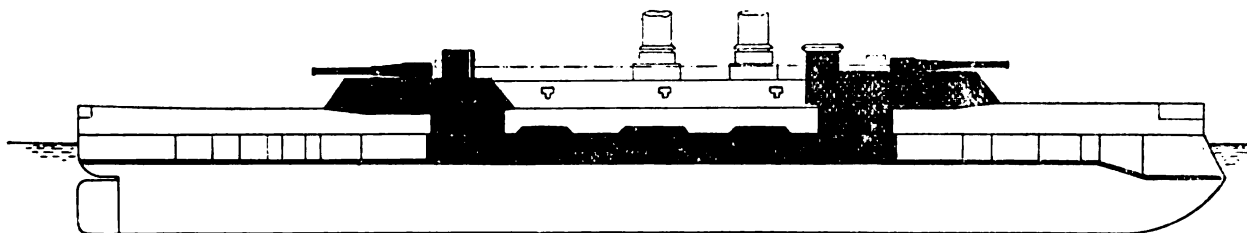
The *Trafalgar*'s specified powers are 8,000-horse power natural draught and 12,000-horse power forced draught; and I am happy to be able to say that on the measured mile these powers ought to give her speeds of about 15½ knots and 16½ knots respectively.

Put in another way the facts are these:—

The *Trafalgar* form is well adapted for the maximum speed intended in the design, 16½ knots; it is not well adapted for higher speeds, and even if large additional power could be developed, very little extra speed would be gained. On the other hand, the greater length of the new designs renders them suitable for speeds up to and beyond 17½ knots, and if additional power were developed the gain in speed would be appreciable.



"SINOPE," CLASS.—FIG. 13.



I must refer to another passage in Sir Edward Reed's letter before passing on; it runs as follows:—

"If the increase of size given to them (the new ships), and the increased cost to be bestowed upon them, were to be judiciously applied by competent persons, the result would be ships having a speed of 20 knots, with a coal supply far beyond that which these ships are to possess. Considering how cheaply speed is now obtained, I cannot myself deny that I should like to see our great ships able easily to overtake any enemy's fleet."

I pass by for the present the allusion to "competent persons," and wish to direct attention to the statement made as to the possible increase in speed. Taking the passage as it stands, I find no allusion to any diminution in armament; the letter, as has been shown, recommends no decrease in armour protection or coal supply, but the reverse; and yet these grand results are alleged to be possible without increase of size.

I do not desire to make this discussion and criticism a personal matter; but I may be permitted to mention that my professional work in recent years has given me a somewhat intimate acquaintance with what is involved in the attainment of high speeds. Nor do I consider that we are at the end of the remarkable progress in marine engineering which has facilitated, or rather, I should say, has rendered possible, recent advances. On the contrary, I recognise many promising methods of getting greater power in relation to weight as likely to influence further practice, and no one will welcome them more heartily than I.

We are considering at present, however, the case of great battle-ships to be built immediately wherein experiments in engineering are clearly undesirable, and where the certain possession of endurance as well as maximum speed is of primary importance. And apart from this fact I entirely challenge the statement that when speeds of 17 to 20 knots are in question for battle-ships, even of the largest size, increase in speed is to be "cheaply obtained." Experience and experiments are contrary to such an assertion, and the onus of proving it to be true lies on the person who makes it.

Figures might be multiplied to show that my contention is correct; but I will only give two illustrations. In the new battle-ships it requires the horse-power to be doubled in order to pass from 14 knots to 17 knots; but a further doubling of the power would not add another 2 knots. This will scarcely be thought a "cheap" increase of speed.

In the Mercantile Marine, speeds of 20 knots are being attained in steamers of 12,000 to 13,000 tons load displacement and 26 ft. draught, but 500 to 560 ft. in length, and having a ratio of beam to draught and length which is altogether inadmissible for a war-ship carrying heavy weights of armour and armament high above water. But even under these conditions speed is not "cheaply" increased from high speeds such as 17 knots to the still higher speed of 20 knots. To take an actual case within my knowledge, the ratio of the power at 20 knots to that at 17 knots was found to be 2 to 1.

In illustrating the truism that great expenditure of power is inevitable when such a speed as 20 knots is obtained, I do not assert that battle-ships may not be produced having that speed. What I challenge is the statement of Sir Edward Reed, that in ships of the size and cost of the new battle ships "competent persons" could produce ships as heavily armed, more heavily armoured, "having a speed of 20 knots, with a coal supply far beyond that which these ships possess." That statement could not have been made if he had given even the most moderate amount of consideration to the enormous power and weight of machinery necessarily required to obtain 20 knots with any possible form of battle-ship; to the serious difficulties involved in providing space for the accommodation of the propelling machinery, boilers, and coal, as well as magazines, store-rooms, &c., under protection in the hold; and to the fact that the maximum draught of water being necessarily a fixed quantity, changes of form, in length especially, and increase in weights of hull and armour, would be unavoidable. All these points are matters of fact, not of opinion. They lie on the very surface of the problem, and they obviously require to be dealt with in a careful scientific manner, not in an airy general style, taking for its basis the idea that speed is now "cheaply obtained."

Before leaving this question of speed, it may be well to point out the fact that these new battle-ships will possess speeds exceeding those of nearly all battle-ships built or building. They will form a squadron of identical character and qualities, capable of proceeding and manœuvring together. Taken as a

group, they will certainly be "able easily to overtake any enemy's fleet." And what is equally important, they will, under the new programme, be associated with a number of very swift cruisers and torpedo gunboats, thus constituting a force complete in all respects, and of unrivalled power as well as speed.

#### COAL SUPPLY AND ENDURANCE.

It was decided, after full consideration, that the new ships should ordinarily carry 900 tons of coal, as in the *Trafalgar*; and be capable of covering the same distance, viz., about 5,000 knots at 10 knots.

Like the *Trafalgar*, the new ships will have a bunker capacity sufficient to carry a much larger quantity of coal if desired.

But whereas any increase above 900 tons in the coal put on board the *Trafalgar* necessitates an increased draught and some loss of speed, in the new designs provision is made (in the form of the so-called "Board Margin") for an unappropriated weight exceeding 500 tons to be carried at the designed load draught and at the full speed.

Strictly speaking, therefore, the case stands thus:—

*Trafalgar*—coal at load draught, 900 tons.

*New designs*—coal at load draught and unappropriated weight, about 1,400 tons.

If the unappropriated weight should be assigned to coal, it would give the new designs a coal endurance of nearly 8,000 knots at 10 knots.

Apart from any such increase in coal, however, 900 tons proposed is a very large supply in relation to expenditure; larger, in fact, than that of nearly all first-class battle-ships. Take for example the *Thunderer* and *Devastation* as completed. They can cover about 4,700 knots at 10 knots. Their full speed for continuous steaming in smooth water is estimated at 12½ knots, and they can cover about 2,700 knots. At that speed with 900 tons of coal, the new ships could cover about 3,500 knots. At the highest speed contemplated for smooth water, continuous steaming—about 16 knots—the new ships could cover about 1,900 knots. The forced draught speed is never intended to be maintained for more than four to five hours continuously; so that an estimate of coal endurance under these conditions is worthless for any practical purpose.

There is one class of ships in the Royal Navy (the *Admirals*) which has an unrivalled coal endurance, and one ship in that class, the *Collingwood*, which surpasses the others. This vessel (the *Collingwood*) is selected by Sir Edward Reed as a standard of comparison on which to base a hostile criticism in dealing with the coal capacity of the new ships. Nor is this all, as the following passage will show. He says:—

"When the *Collingwood* was designed, she was provided with engines of 7,000-horse power, and a coal supply of 950 tons. The proposed new ships are to have 13,000-horse power and in the same proportion should carry 1,760 tons of coal; but, incredible as it may seem, 900 tons of coal is all that is to be allowed them."

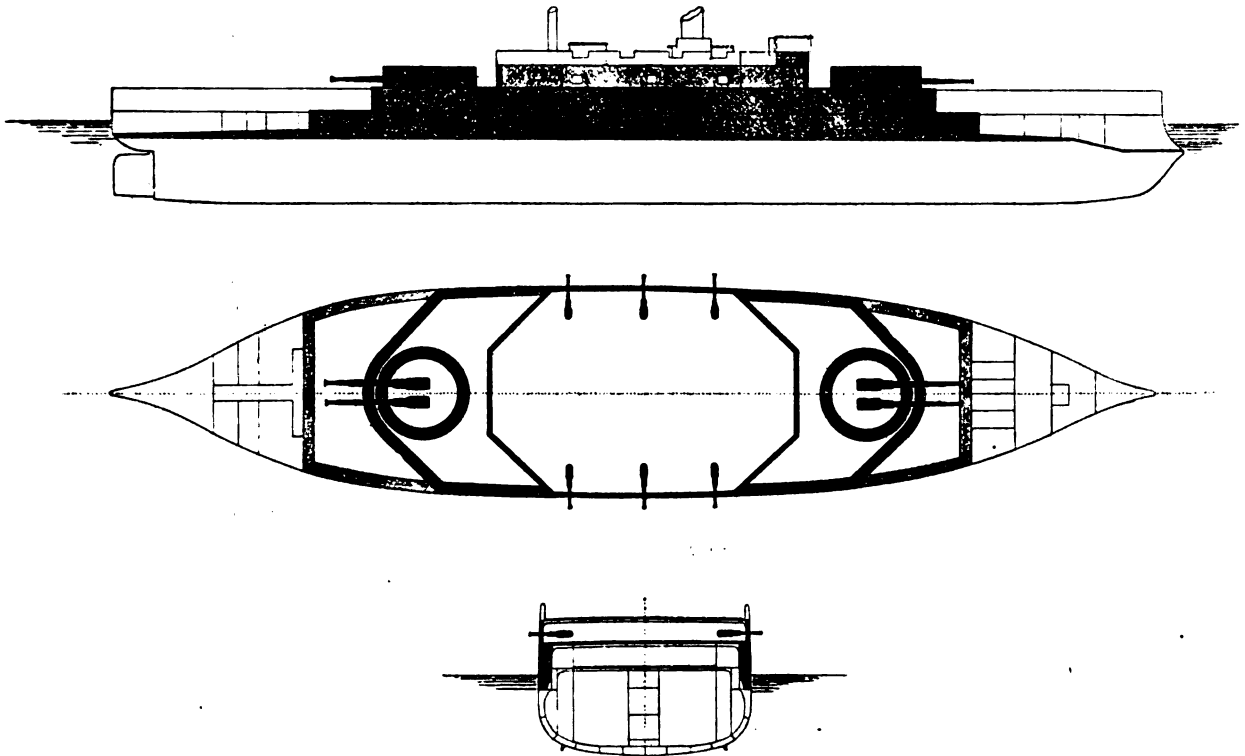
It will be sufficient to indicate in the briefest fashion the misleading character of the comparison here made.

(1) The 7,000-horse power mentioned for the *Collingwood* was with *natural draught*; the 13,000-horse power for the new ships is with *forced draught*, their natural draught power being 9,000-horse power.

(2) The new ships will have triple-expansion engines, which may be assumed to be at least 15 per cent. more economical in coal consumption than the compound engines fitted in the *Collingwood*.

(3) The *Collingwood* can steam about 7,000 knots at 10 knots, if she starts with 900 tons of coal, her full authorised quantity. The new ships with the same weight of coal will steam 5,000 knots at 10 knots; to cover 7,000 knots they would have to start with about 1,250 tons of coal, or 350 tons more than the ordinary supply of 900 tons. This 350 tons is (as explained above) less by more than 150 tons than the unappropriated Board Margin which has to be carried at the load draught and full speed in the new ships.

The coal endurance of H.M. ships has to be regulated by other considerations than those of mere comparison with the corresponding feature in foreign ships. To this point I referred at length in the discussion on Sir N. Barnaby's paper on "Fuel Supply," published in the *Transactions* for 1887. But it may be interesting to state that no foreign war-ships, except, perhaps, the *Italia* and *Lepanto*, have coal endurances approaching those of the new designs. And further, it must be remarked that published statements of coal endurance for foreign ships are frequently



"NILE" AND "TRAFALGAR."—FIG. 15.

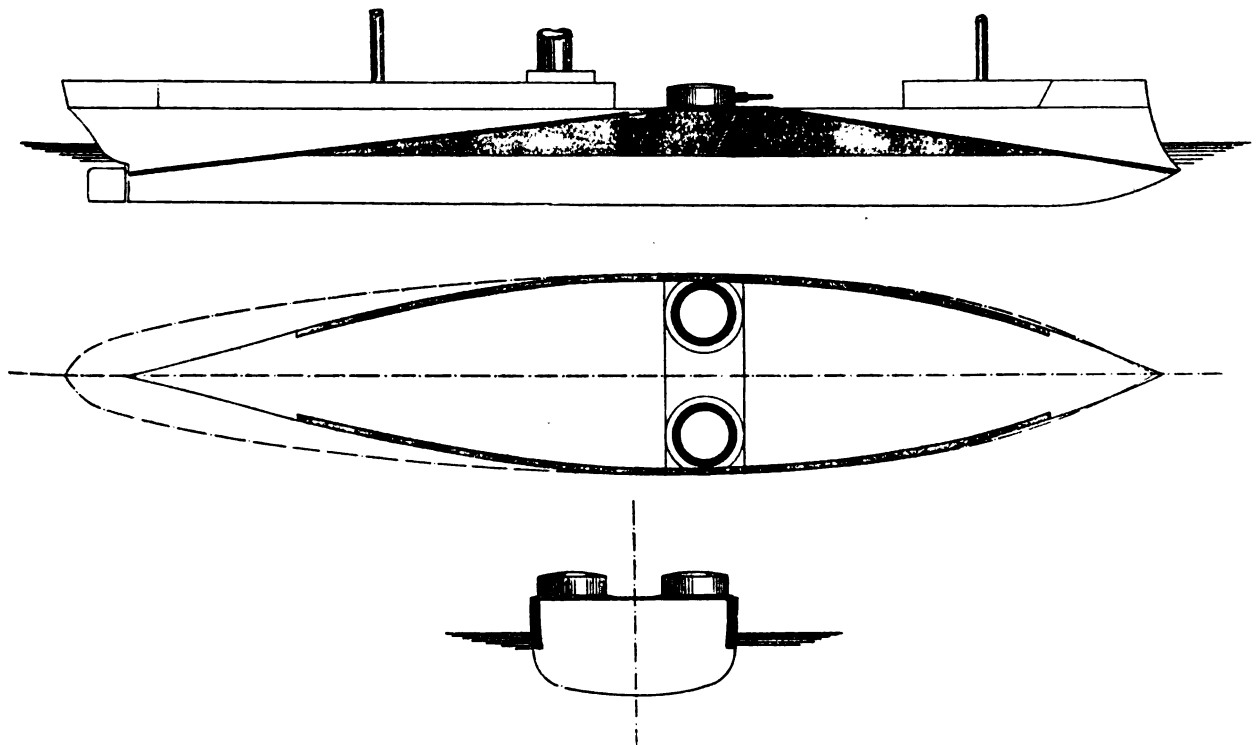


FIG. 16.

based upon mere bunker capacity, and not upon the coal carried at the reputed load-draughts and full speeds.

#### REMARKS ON THE SIZE OF NEW BATTLE-SHIPS.

In conclusion, I desire to make a few remarks on the criticisms that have appeared with reference to the very large size and displacement of the new battle-ships.

These criticisms may be arranged in two groups.

First: What may be termed the "too many eggs in one basket" class of objection.

Secondly: Those which allege that the ships have been made unnecessarily large in relation to the qualities of speed, coal endurance, armament, and protection they are intended to combine.

The first class are criticisms of the policy represented in the designs, and these I shall leave unanswered, since the Board of Admiralty are responsible for that policy, and I am their technical adviser. But it will be noted that the procedure followed in deciding on the designs involved a selection from amongst a number of alternatives representing ships of various classes, sizes, and costs.

Independently of actual experience in a great naval war, and the experimental demonstration of the relative advantages and disadvantages of a group of smaller ships, as against a less numerous squadron of ships individually more powerful—the aggregate outlay in each case being the same—the choice between the two policies of construction must be largely a matter of opinion. But I presume it will be admitted that the Admiralty and its naval advisers constitute as competent a body as can be found to deal with such matters.

Moreover, it must be noted that in the existing fleet we already have large numbers of battle-ships of less size and cost than the projected vessels; and that the new programme associates with the eight first-class battle-ships, two second-class battle-ships of moderate size, and a very large number of swift cruisers. So that taking the fleet as a whole all views may be considered to be represented.

The second class of criticism is one that peculiarly concerns myself as the responsible designer of the ships; for it really amounts to a charge of professional incompetency. If these ships have been made larger and more costly than was necessary to secure the combination of qualities decided on by the Board of Admiralty, then I, primarily, and my colleagues and assistants in the constructive and engineering department of the Admiralty, are clearly to blame.

Sir Edward Reed has made this charge of "incompetency" in unmistakable language in the passage above quoted when dealing with speed.

And further on in his letter he states—"The day for getting the best possible ships out of our Whitehall office is past and gone."

It would have been interesting if he had fixed the date from which this decadence in the "Whitehall office" began; but that is not done in the letter from which I have quoted.

In dealing with this serious allegation, I desire, however, to sink all personal feeling, and to disregard the attack made on the "competency" of the Admiralty professional officers. My intention is to put a plain statement of facts before the Institution, and to allow the facts to speak for themselves. Fortunately, my task is easier, because Sir Edward Reed has himself requested that the "comparison which he has set up between the *Nile* and *Trafalgar*, and the proposed ships," may be tested; and this I will now proceed to do. To make the comparison as precise as possible, I will take the new turret ship design, and, to make it complete in this place, I will repeat some figures already given.

On the tabular statement for the various classes of battle-ships on pages 66 & 67, the principal particulars for the *Trafalgar* (as designed) and for the new ships are compared. Originally the *Trafalgar* was intended to have a load displacement of 12,000 tons, and a mean load draught of 27½ ft., trimming one foot by the stern, with 900 tons of coal on board.

It is explained, however, in the Parliamentary Papers, that owing to various additions made during construction and to other causes, the completed *Trafalgar* will be 500 tons heavier, and draw about 10 in. more than designed. For purposes of comparison, therefore, she must be taken as a vessel of 12,500 tons, having a mean draught of nearly 28½ ft., and an extreme draught aft of 29 ft., with 900 tons of coal on board. When she fills up her bunkers to 1,200 tons she will draw about 6 in. more.

Here then we have the true starting-point in the comparison

with the new ships: a vessel of 12,500 tons drawing 28½ ft. mean and 29 ft. extreme.

With these facts before them, the Admiralty decided that in the new designs the original mean draught intended for the *Trafalgar* (viz., 27½ ft.) should not be exceeded; and this decision is set out in the Parliamentary Papers.

Before this Institution it is scarcely necessary for me to dwell upon the great influence which this decision to keep to a draught shallower by one foot than the actual draught of the *Trafalgar* must have had on the new designs. But Sir Edward Reed, although himself a naval architect, ignores the detailed statement of facts in the Parliamentary Papers, and makes no allusion to the consequences.

I will very briefly correct his omission, and state what the change in size would be if the *Trafalgar* were re-designed to float at the 27½ ft. mean draught, carrying the same armament, the same equipment, the same armour protection, and to steam at the same speed as the actual *Trafalgar*. To fulfil these conditions would involve an extra length of about 20 ft., and would require a displacement of about 13,000 tons.

Keeping these figures in mind let us turn to the new ships, which are to be 380 ft. long, 14,150 tons displacement, and 27½ ft. mean draught.

They are consequently of 1,650 tons greater displacement than the *Trafalgar* as completed, but of 1 ft. less draught. They are of about 1,100 to 1,200 tons greater displacement than the re-designed *Trafalgar* floating at the same draught would be.

Now let us see how this difference in displacement (1,100 to 1,200 tons) is made up; and here the ground has been cleared by some of the statements made in the preceding pages.

The following are (in round figures) the excesses in loads to be carried in the new ships, quite independent of increase and size:—

Auxiliary armament .. ..	300 tons.
Increased complement, &c. ..	60 "
Board Margin of weight (equivalent to enlarged coal supply) .. ..	520 "
Weight of armour, &c., to lift turret guns 2 ft. higher above water than in <i>Trafalgar</i> .. ..	150 "
Total increase in load ..	1,030 "

To carry this heavier load on the same draught (27½ ft.) as the re-designed *Trafalgar* necessarily requires a longer and larger ship, and therefore a heavier hull. Furthermore, in the new ships, as explained above, machinery of greater power than that in the *Trafalgar* is to be provided, not for the purpose of driving the larger ships as fast as the *Trafalgar*, but to obtain an absolutely higher speed, the difference in speed being at least half a knot, and possibly more, in favour of the new ships.

The foregoing statement of facts will probably be found sufficient by members of the Institution to explain the increase in size of the new ships; and to illustrate the statement which I will now add. They have not been made any longer or larger than is absolutely necessary—under existing conditions of naval architecture and marine engineering—to fulfil the conditions laid down by the Board.

My friend and colleague, Mr. Sennett, and I are perfectly acquainted with the savings in weight or equivalent increase in power and speed which would be possible if we had adopted certain new types of boilers or novel arrangements of machinery which have undergone limited trials with considerable success.

We are, moreover, most favourably disposed towards the gradual developments of all systems which promise such beneficial results. But we do not consider it wise or right to make such experimental trials on ships of the magnitude and importance of these new battle-ships. And after the fullest consideration our advice to the Board has been to adhere to arrangements with which we have experience, and of which the success is assured.

Before sitting down I will add two or three statements which appear to be of some importance when dealing with the relatively large size of the new ships.

First: They have been shown to be made large by the great loads of armament equipment and Board Margin they carry on a moderate draught at high speed.

Omitting the Board Margin (or allowance for contingent additions during construction) the ships are of 13,600 tons displacement, and about 26 ft. 8 in. mean load draught. These

are the figures strictly comparable with the other ships: using them, the following table is instructive:—

	Length.		Mean Draught.		Displacement.	Maximum Speed.
	ft.	in.	ft.	in.	Tons.	Knots per hour.
New ships (excluding Board Margin) ..	380	0	26	8	13,600	17½
Trafalgar (as designed) ..	345	0	27	6	12,000	16½
Inflexible ..	320	0	25	3	11,880	3·8
Dreadnought ..	320	0	26	9	10,820	14·2
Minotaur ..	400	0	26	9	10,690	14·4
Warrior ..	380	0	26	9	9,210	14·1
			Extreme Draught.			
Italia ..	400	6	31	3	13,900	18
Lepanto ..	400	6	30	9	13,550	18
Sicilia ..	400	0	28	6	13,253	18
Admiral Baudin ..	321	6	26	2	11,380	15

Second: The new ships, although of a displacement surpassing all previous battle-ships, are certain to be much more manageable than many of their predecessors with equal or greater length, and not possessing twin screws.

Lastly, it will be seen that since the increase in size is chiefly due to increase in load, the assumptions that have been made by Sir Edward Reed and others as to relative increase in cost are not well founded. I am not at liberty to make any statement respecting the Admiralty estimate of cost for these ships, for reasons which will be obvious. But this I may say, that while the total weight of protective material in the new ships is greater than the corresponding total in the *Trafalgar* by something like 150 tons, the adoption of the 5-in. armour in association with redoubts, instead of a central citadel thickly armoured throughout, has the result of largely reducing the cost of the armour. This was not the reason, however, for the adoption of the system, as has already been explained. At the next meetings of the Institution this question of cost may be debated on the basis of ascertained figures, and I therefore say no more.

The paper has extended to an unusual length, yet I venture to believe that this has been warranted by the importance and range of the subjects treated. It has unavoidably assumed a controversial character in certain parts; but I am not responsible for the circumstances, and I trust that nothing has been said by me which goes beyond fair reply or criticism. I have, in fact, been put upon my defence as a naval architect who holds a position of some public importance, and who should clearly cease to occupy that position if the allegations of incompetency that have been made so freely and publicly could be sustained. But beyond any personal interest in the matter, I appear here as the representative and head of the Constructive Department of the Admiralty—the “Whitehall Office,” which is said to be no longer capable of producing “the best possible ships.” Apart from the fact that I am the head of that staff, and apart from any question of my personal competence, I desire to state that there never has been a time during my experience of the Admiralty Office—an experience extending over twenty-two years—when the members of that staff included so many thoroughly educated, capable, and qualified naval architects and marine engineers as are now serving there. The great system of technical education, established by the Admiralty twenty-five years ago, largely in consequence of the recommendations of this Institution, has borne good fruit, and the Public Service is reaping the benefit, not merely at the Admiralty, but in the Dockyards; while, outside the service, men similarly trained have risen to the highest professional eminence.

If with such a staff, with all our recorded data and experience, with our grand experimental establishment at Haslar, so ably conducted by my friend Mr. Froude, and with all the valuable assistance and suggestions coming to us from the Naval Service, and our professional colleagues in the Dockyards, as well as the constant benefits we derive from a full knowledge of the work done by private shipbuilders and foreign competitors, we do not, in the “Whitehall Office,” succeed in producing “the best possible ships” consistent with the instructions of the Board of Admiralty, then there can be no excuse. But I contend that the allegations made against the professional officers of the

Admiralty have been loosely made, and are proved to be unfounded, as regards the designs of the new battle-ships, by the facts which have been adduced.

A much more important question than that of our professional competency arises from the discussion; and public interest must chiefly centre in it, since it seriously affects the national defence. Assuming that we have done the best that could be done under instructions received from the Board of Admiralty, the country desires to know whether the ships proposed to be built are “the best possible ships” which can be added to the Navy under existing conditions of naval warfare.

On this question I shall not be expected to give an opinion. It involves an inquiry into the competency of the Board of Admiralty and our system of naval administration. But at the risk of repeating statements already made, I must say that there never have been designs more deliberately and carefully considered. The selection was made from amongst a large number of alternative designs, after a careful review of what is being done abroad, and with reference to various proposals not yet embodied in actual ships. Fortunately, it could be based upon a great mass of new experimental data, obtained by actual trials against the *Resistance* and elsewhere, and giving the latest and best information in relation to guns, projectiles, explosives, and armour. Moreover, the Board of Admiralty has availed itself of the advice and assistance of a number of distinguished officers before coming to a decision.

A complete account of the action taken, and the reasons for the various conclusions reached, has been placed before the public. Obviously there is room for differences of opinion, since actual experience in naval warfare under modern conditions is almost entirely wanting. The matter, therefore, resolves itself into one of *relative authority* and *experimental information*. Under these circumstances, the Naval Service and the country will probably prefer to accept the conclusions of a responsible and well-informed body like the Board of Admiralty, rather than those of any individual.

SIR E. J. REED, M.P., said Mr. White's concluding remarks had gone very far in his judgment to explain the harder and harsher parts of his (the speaker's) criticisms. He would like at the outset, in order to relieve the debate as far as possible from personal feelings, to say that it had been with immense regret that he had had to cast antagonistic reflections upon fellow-professional men, were it not that he was encouraged by a knowledge of the fact that if he had not been doing so for a long series of years the country would have had very different ships built for the Navy from those now before the Institution. He would like to explain that, although Mr. White had been courteous enough to furnish him with a copy of his paper as early as possible, it had only reached his office in the middle of the day previous, and had not come into his hands until the evening at the House of Commons, and until that morning he had been unable to read a line of it. He took no objection to any part of Mr. White's paper, or to the tone in which it was couched. Mr. White had been fair and moderate, considering the nature of the attacks to which he (the speaker) had more or less subjected him, and he was glad to know that Mr. White had not made the present the occasion of aggravating any differences which existed between them upon those matters. The first point he would like to refer to was that there was some mystery which nothing that had been said in the Parliamentary Papers, or in Mr. White's paper, had cleared up—a mystery attaching to the part that naval officers outside the Admiralty had taken in connection with this business. Mr. White's own statements were rather peculiar. He said, “The choice eventually made by the Board was made from among a considerable number of alternative designs, and before coming to the design the First Lord convened a meeting.” There were gallant gentlemen present who would be able to put the matter right later on, but as he had read the papers, the course taken was that the naval gentlemen with whom the Admiralty took counsel at Devonport were consulted as to certain matters, of which the first was the nature of the armament and its disposition and placing. He, for one, closed at once with the doctrine that, in building a first-class battle-ship for this country, armament considerations ought to take a first place. The first consideration in building such vessels should be to keep them afloat in the face of any fire which might be brought against them, and they should be of such construction that the small armaments of the enemy should never be able to destroy them. That had been the

ground of the whole of his public agitation against such ships. He raised the point because it seemed that the question of armament was given the first place in the deliberations of the naval officers, and none of the papers said whether it was so, or what the naval officers wished to be done. All he knew was that they decided on what the disposition of the armament should be, and that was made a matter for primary consideration. His objection to the new battle-ship, and the reason he denounced it as an abuse of naval construction, was that it carried such an enormous weight, and cost such immense sums of money for armour plating, which at the same time added nothing whatever to save the ship when in danger of being injured by heavy fire. He referred to the redoubts designed by Mr. White, which gave next to no advantage in the way of protecting the ship when in battle, and said he would do nothing which would sanction the application of the public money, and the risking of the lives of the officers and men, in connection with ships which were not provided with the fundamental quality of being able to keep afloat. Mr. White had utilised in his paper a good many circumstances which were open to him to avail himself of, but he could not allow Mr. White all the advantages which he claimed. In the case of the *Nile* and *Trafalgar*, Parliament had had put before it a

that whenever he saw a new ship laid down, and noticed in *The Times*, he found that it was invariably "designed by Mr. White." Therefore, as Mr. White stood before the world as the responsible designer, and as they knew nothing of what amount of pressure had been put upon him, they were obliged to hold him responsible for that to which his name was affixed. If, then, Mr. White put the position of large auxiliary armament before the provision of the floatation and stability of the ship, he disagreed with him absolutely, and should oppose him to the utmost of his ability. The First Lord of the Admiralty, in his speech before Parliament, stated that the new ships, as regarded their armour defence, were ships more of the *Nile* and *Trafalgar* type than of the *Admiral* class. He admitted that Mr. White got some advantage from his 5-in. armour. But no importance was to be attached to that, for the reason that perhaps there was not a man in the room who could doubt that the enemy would knock to pieces that 5-in. armour with his larger guns. As soon as that was done the ship actually became of the *Admiral* type rather than the *Nile* and *Trafalgar* type. The distinction was that in the *Nile* type the armour came up to the deck above the water, and in the other type it did not. Therefore he found that the First Lord of the Admiralty would have been under a total misapprehension as to the nature of the

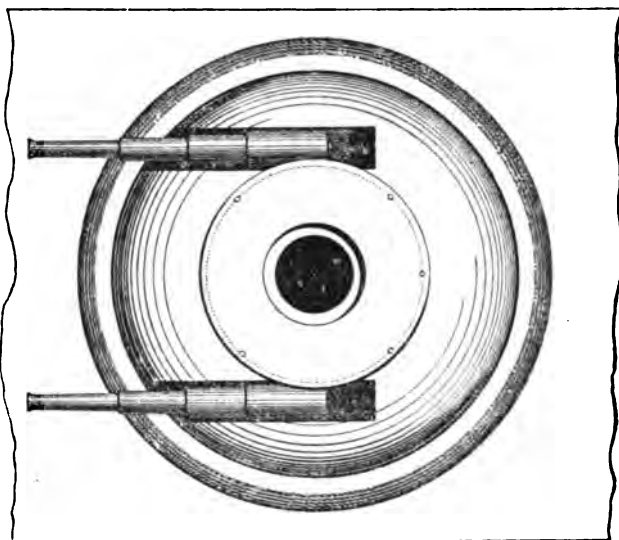
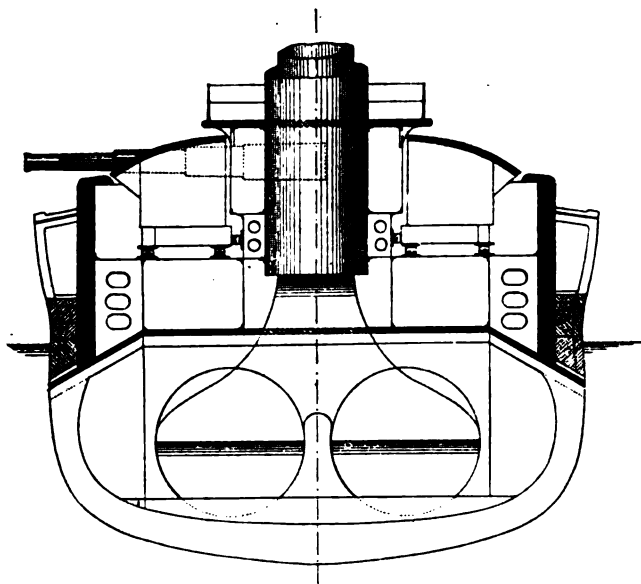


FIG. 17.

The portion below the protective deck has been added to the sketch in patent specification for the purposes of the diagram.

design for a ship of 12,000 tons, to conform to certain conditions and to accomplish certain objects. Before the matter was discussed, however, the *Nile* and *Trafalgar* had undergone a change. He made his comparison of the new ships with the *Nile* as she was designed, and objected altogether to having her brought forward as she was in her altered condition. This brought him to a condemnation of the narrow belt. The *Nile* and *Trafalgar* had been overburdened in the course of construction by 500 tons or thereabouts, but as fighting ships no officer or man need hesitate, any more than if the ships had been built as designed, to go with them into battle. On the contrary, the *Nile* and *Trafalgar*, as now constructed, were in reality better fighting ships than they were before. He did not for a single moment wish to call into question the qualifications, views, or principles of Mr. White and his predecessors. He had not the slightest doubt that if Mr. White was obliged to stand idly by and take all the guns and other conditions which the Board of Admiralty imposed upon him—for he noticed that Mr. White frequently retreated behind the name of "the Board"—if he did that, it was not to be doubted Mr. White had worked out the design perfectly well, as he was capable of doing. But the reason he was rather disposed to visit those designs upon the constructor was this—

ships' armour if he himself had not been in the House to stop and correct him, and make the House of Commons understand that the armour of those ships was disposed after the fashion of the *Nile* and *Trafalgar*. Mr. White had asked at one point of his paper at what period the Admiralty Office decadence began. It began when the Admiralty turned out the *Inflexible*. When the Conservative Government took office in 1885 he himself went down to the Admiralty to see a distinguished naval officer, who then occupied a high position of responsibility, and inquired what was to be the policy of the new Board. The officer informed him that the policy was to have no more ships of the *Admiral* class, or anything approaching to it; they would have "the *Dreadnought* brought up to date." There was a point in the argument of Mr. White to which he attached some importance. Mr. White pointed out that when the redoubts were of the kind used in the new barbette ship the projectile could not easily get into them. He understood that what was said in the House of Commons was that unless the actual redoubt was penetrated it was impossible to injure the machinery or the guns, whereas if it were in a larger redoubt a shell might enter the more readily. But were they to be told that they could therefore take away 16 inches of armour and put on five inches of light armour which would let an enemy's shell into the

interior? Mr. White had pointed out that an essential difference between that new barbette type and the *Admiral* type was that the armour had a certain extra percentage in length. He (the speaker) had not said that those ships were so deficient of armour as the *Admiral* type was. He had acknowledged that the belt was larger and about one inch higher, and he did not say that those vessels were so liable to such disastrous results as vessels of the *Admiralty* class. He could not not for a moment assent to Mr. White's view that it was better to bring the main armour down near the water surface and put 5 in. above it rather than to carry the solid armour up to a much more reasonable height. Mr. White had referred to the coal protection of certain vessels, but if any one was a regular reader of *The Times*, and had happened to look at the naval intelligence lately, he would have seen a remarkable instance of the utility of coal protection. The *Orlando* had had the misfortune to have all her armour disappear under water. She was given some coal protection, the result being that so much additional work was imposed on the men that the stokers had to leave the stoke-holds, and the seamen had to go below to assist. He was, therefore, rather surprised that any officer of the Admiralty should refer to that subject. On the question of speed, Mr. White had not made himself at all clear. With regard to the point about speed being cheaply obtained, the form which Mr. White's criticism took coincided with the idea he himself wished to express. When he began to deal with ironclads, if they wanted an engine of 4,000 horse-power they would require about 750 tons of weight to get it; whereas they were able now with a given weight to get more than double the power. Therefore they got power now more cheaply than in those days.

Mr. WHITE said the remark made was that speed was cheaply obtained, not power.

Sir E. J. REED said to his mind the terms were synonymous for the purposes of argument. If power was not cheaply obtained and speed with it, how did it happen that in the *Blake* and the *Blenheim* they had 20,000 indicated horse-power? Therefore, was he not justified in saying that with a ship of 9,000 tons they could carry machinery and have 20,000 horse-power. He need not say how sorry he was to have to take up his present attitude with regard to Mr. White. He had no question in his own mind as to his perfect competency to work out a design and have it carried through. That work was not the sort of thing he referred to when he spoke of "incompetence." Owing to the force of circumstances and divided responsibility, they did not get the best out of any particular man, whether naval officer or naval architect. And one good result of denouncing the Admiralty for incompetence was that a great deal more had been made known about those matters than otherwise would have been known. His sole desire was to see the Navy of this country and every ship belonging to it as strong and as safe as it could possibly be.

Lord ARMSTRONG observed that the interest of this discussion obviously turned upon the debate between the two principal champions, Mr. White and Sir Edward Reed, and he could not help thinking that they would regard with very little interest the observations of one who had merely listened to the paper and had no opportunity of digesting its contents. With regard to the question of armour, it certainly appeared to him that from what they had heard from Mr. White and Sir E. Reed, and from what they saw in these diagrams upon the walls, they must come to this conclusion—that to render a ship absolutely safe from destruction by modern artillery they must eliminate also its power of sinking or destroying anything else. It appeared to him that there must be a compromise between offensive power and defensive power, and as far as he could judge from a hasty inspection of the diagrams, and from listening to all that had been said, it did appear to him that the compromise which was presented by these latest designs, and especially by the battle-ship of the barbette stamp, was the best compromise as between defensive power and offensive power that had as yet been submitted to the public. However secure a battle-ship might be made against the attacks of artillery, there still remained other modes of attack against which she was no more secure than an absolutely unarmoured ship. She was liable to be attacked by torpedoes or by rams exactly the same as an unarmoured ship. If it were possible to devise a ship that should be secure not only against artillery, but against the attack of torpedoes or rams, and which should at the same time not exceed in weight or dimensions the designs here exhibited, then he could only say it would be a matter of extreme interest if they could have before them the particulars and the design of such a ship. What he had heard to-day only

tended to increase the disfavour with which he looked upon the armoured class of battle-ships as a whole. He could not lose sight of the fact that, do what they would, they could not make these ships absolutely invulnerable or absolutely secure against sinkage, while the enormous cost involved in their construction must prevent our having a numerous Navy. We required for the protection of our commerce and for general service that our Navy should be extremely numerous, and the only possible means of obtaining a Navy of sufficient number for this purpose was to restrict our expenditure upon ships of the armoured class, and increase our expenditure upon cruisers. The question of policy was hardly involved in the present paper; it was a question of construction. If it had been a question of policy between cruisers and line-of-battle ships he might have had more to say upon the subject, but observations upon that point were without the sphere of the present paper, and he did not feel himself so competent as many other persons might do to enter upon questions of construction.

Lord CHARLES BERESFORD thought Lord Armstrong had hit the right nail on the head in this great controversy as to the platform which they should build, on which to send their men and guns to sea to fight an action. The controversy was between the armament and the armour, and if a ship were built with the capabilities which Sir Edward Reed demanded, and very justly demanded from his point of view, she would have nothing offensive to hit the enemy with. That was the real point. A ship was always a compromise between offence and defence, and he would like to give his views as a seaman and as one of the men who had to fight the ship, believing that his views were shared by his brother officers. He considered Mr. White had done a great service in bringing this question before the public, in order that people might see which argument was sound and which was unsound. Our existence depended upon the strength of our battle-fleet. He thought Sir Edward Reed's contention was wrong with regard to the new battle-ships. As to vessels of the *Admiral* class, he thought that was a very bad class; for his own part, he favoured an armoured vessel, as she could not be put out of action unless her armour were pierced; but, with the ships of the new design, he believed the armour need not be pierced at all, but that with a large auxiliary armament brought to bear upon her she might be capized. The naval constructors would probably argue against him, but it must be remembered that he spoke from a seaman's point of view. Without being sunk, a vessel of the new design might be put out of trim by the admission of water, and a vessel of equal power coming against her in that condition ought to win. But, whether these ships were of the best class, or not, we must remember that we had got them, and we must do as Englishmen always had done, namely, do the best we could with them. Ships had but little to apprehend from the passage of shot through the plates, as the hole could easily be blocked. Their apprehensions were greatest from shell fire, and he reminded the meeting that in the Black Sea war the Russians destroyed the Turkish ships because they had shell guns and the Turks had none. The French then began to build a ship designed to keep out shell fire. As far as they knew at present the 5-inch steel deck with which the new ships were to be fitted would explode nearly any shell, and would certainly explode the high explosive shells, and, even if the shells got through the armoured deck there would only be the fragments of the shell instead of a shell exploded underneath the deck. If they were to have high armoured ships like the *Nile* and the *Trafalgar*, they must sacrifice what he regarded as of great importance, and that was the large auxiliary armament. There must be a compromise between the offensive and the defensive, and he hoped his brother officers, whom he saw present, would agree that what they wanted most was the offensive part in the ship, while they were very glad to have as much of the defensive part as they could. But they did not want to sacrifice the offensive power which they at present possessed of knocking the enemy into a "cocked hat." Speaking as a seaman, they did not want to be able to say to the enemy, "You can't hurt us." What they wanted to do was to be able to say, "We can hurt you." He could not well put it plainer than that. Great exception had been taken to unarmoured ends, but there again there must be a compromise. If the authorities came to the conclusion that the ends ought to be armoured, there was a great deal in that argument, because it strengthened the power of the ship; but the more armour was put on a ship the greater must be the reduction made in the auxiliary armament, or the armoured turrets must be reduced. As there must be a compromise he thought that the Board of Admiralty had done

## PARTICULARS OF BRITISH

	New Designs.		TRAFALGAR.	SULTAN.	DEVASTATION.		FURY.	DE NOU
	Turret Ship.	Barbette Ship.	As designed.	As designed.	As designed.	As completed.	As designed.	
Date of Design .. .. .	1889		1885	1868	1869	1873	1870	11
Name of Designer .. .. .	Mr. W. H. WHITE.		Mr. BARNES Mr. MORGAN		Sir EDWARD REED.			
Length .. .. . feet	380 0		345 0	325 0	285 0		320 0	32
Breadth .. .. . "	75 0		73 0	59 0	62 3		62 3	6
Draught (mean) .. .. . "	27 6		27 6	25 0	26 2	26 8	26 2	2
Displacement .. .. . tons	14,150		*12,000	+8,700	9,060	9,300	10,460	10
Freeboard .. { Forward .. .. feet	11 3	19 6	11 3	19 8	9 3	8 6	10 4	1
{ Aft .. .. . "	11 3	18 0	11 3	17 9	5 0	4 6	5 6	1
I.H.P. .. { Natural draught ..	9,000		8,000	7,200	5,600	6,600	7,000	8
{ Forced .. .. . "	13,000		12,000	....	....	....	....	.
Speed .. { Natural .. .. knots	16.0		15.0	14.0	12.5	13.8	13.5	.
{ Forced .. .. . "	17.5		16.5	....	....	....	....	.
Coals carried at the designed load draught .. .. . tons	900		900	600	1,700	1,350	1,600	1
Coal endurance at 10 knots .. knots	5,000		5,000	1,700	4,800	4,700	4,000	5
Armament .. {	Main .. .. .	4-67 ton B.L.	4-67 ton B.L.	8-18 ton M.L. 8-12½ ton M.L. 2- 6½ ton M.L.	4-25 ton M.L.	4-35 ton M.L.	4-38 ton M.L.	4-38 ton M.L.
	Auxiliary .. .. .	10-6 in. Q.F. 18 6 prs. Q.F. 3 prs. Q.F.	10-6 in. Q.F. 24 6 prs. Q.F. 3 prs. Q.F.	8-5 in. B.L. 18 6 prs. Q.F. 3 prs. Q.F.	16-24 prs. Howitzers	Boat and Field Guns only.		
Weight of Projectile (heaviest) .. lbs.	1,250		1,250	410	548	714	714	
Weight of Charge .. .. . "	630		+520	70	85	140	140	
Total Weight of Armament .. tons	1,420	1,410	1,035	560	355	515	515	
Weight of Auxiliary Armament ..	480	500	135	22	....	....	....	
Height of centre of metal of heavy guns above designed water-line } feet	17 0	23 0	15 0	13 6	14 9	14 3	15 6	1
Length of Belt .. .. . "	250 0		230 0	Whole length	Whole length	Whole length	Whole length	Who
Greatest thickness { Side armour ins.	18		20	9	12	12	12	
{ Protective Deck ..	3		3	....	3	3	3	
Weight of Horizontal Armour Deck, Glacis Plates, &c. } tons	1,100		1,040	....	415	556	600	
Total Weight of Armour and Backing, including Protective Deck .. .. . "	4,550		4,400	1,800	2,700	2,900	3,330	
			* Displacement, when complete, will be 12,500 tons. + Now 630.	+ Displacement as completed, about 9,300 tons, including 460 tons of ballast.		See Fig. 4 as to superstructures and armoured bulkheads added during construction.  See also page 8 of "Transactions," I.N.A., for 1873.	Work stopped early in 1871, and design cancelled.	

## FOREIGN BATTLE SHIPS.

FLEXI- BLE.	COLLINGWOOD.		CAMPERDOWN and ANSON.		SACHSEN.	DUILIO.	ADMIRAL DUPERRE.	MAGENTA CLASS.	ITALIA and LEPANTO	SINOPE CLASS.
	As designed.	As completed.	As designed.	As completed.						
1874	1880	1886	1882	1888	1877	1872	1876	1881	1877	1883
Sir NATHANIEL BARNABY.					German	Italian	French	French	Italian	Russian
20 0	325 0	325 0	330 0	330 0	298 0	332 0	311 0	323 0	400 6	300 0
75 0	68 0	68 0	68 6	68 6	60 0	64 9	66 11	65 7	72 9	69 0
25 3	25 9	26 4	26 9	28 0	19 8*	26 7*	26 9*	27 3*	31 3*	26 0*
11,860	9,200	9,500	10,025	10,650	7,400	11,138	11,100	10,580	13,900	10,800
9 6	12 6	11 11	11 6	10 3	....	....	....	....	....	....
9 6	11 6	10 11	11 6	10 3	....	....	....	....	....	....
8,010	7,000	....	....	....	5,600	10,000	5,780	7,000	18,000	....
....	....	9,500	9,500	11,000	....	....	8,000	....	....	13,000
13-8	15-0	....	....	....	14-0	15-0	....	....	....	....
....	....	16-5	16-0	16-8	....	....	14-2	15-0	18-0	16-8
1,200	950	900	900	900	700†	1,279†	....	600	1,650†	886†
4,200	7,300	7,000	....	6,000	Not known accurately.					
40 ton M.L.	4-43 ton B.L.	4-45 ton B.L.	4-63 ton B.L.	4-67 ton B.L.	6-18 ton B.L.	4-100tn.M.L.	4-47 ton B.L.	4-52 ton B.L.	4-100tn.B.L.	6-50 ton B.L.
8-20 prs.	6-6 in. B.L.	6-6 in. B.L. 12-6 prs. Q.F.	6-6 in. B.L.	6-6 in. B.L. 19 6prs.Q.F. 3prs.Q.F.	4-15 prs.	1-33 pr. 4-3 in. B.L.	1-6 in. B.L. 14-5½ in. B.L.	17-5½ in. B.L.	8-6 in. B.L.	7-6 in. B.L.
1,700	714	714	1,250	1,250	412	2,002	926	926	2,002	732
450	315	295	520	630	126	507	258	357	661	247
820	660	760	960	1,070	....	....	....	....	....	....
....	120	200	160	200	....	....	....	....	....	....
13 6	21 6	20 11	21 0	19 9	....	....	....	....	....	....
110	140 0	140 0	150 0	150 0	....	....	....	....	....	....
24	18	18	18	18	16	21½	21½	18	....	16
3	2½	2½	3	3	....	....	3	3	8½	3
970	905	940	1,140	1,210	....	....	....	....	....	....
1,540	2,730	2,780	3,150	3,130	....	....	....	....	....	....
Figures above relate to armament usually carried lighter turret guns were originally reposed.	See Parliamentary Paper, No. 222, of 1887.		See Parliamentary Paper, No. 287, of 1886.		NOTE.—These particulars are chiefly taken from Lord Brassey's "Annual." • These are extreme draughts. † These are believed to represent the bunker capacity, and not the amounts carried on the draughts given.					

the wisest thing in adopting the present defence. With reference to the auxiliary armament, no one knew what was going to happen in a battle. One shot might win an action by exploding a powder charge and communicating the gas to the magazine, and so a ship might be lost. He noticed that one of his brother officers (Captain FitzGerald) did not agree with that, but Captain FitzGerald had had no experience any more than he himself had. These possibilities did exist in action, and therefore what their efforts should be directed to was to try and hit the enemy as often as they could, for they none of them knew what might happen when they got into action. As to the question of coal supply and the question of speed, there was a great diversity of opinion, but having regard to the compromise he thought that a ship, according to the new designs, was the best class of battle-ship they could have in the present day. Referring to the system of naval administration, Lord Charles said he never lost a chance of abusing the system. He thought the system at the Admiralty, and the same with the War Office, was ludicrous; it was utterly and entirely wrong. At all events, that was his idea of it. How it was that officers and men had done so well as they had under such a system he could not for the life of him understand. It was almost impossible for a seaman under ordinary conditions to resign his post at the Admiralty; he was sure to find somebody else to take it, and the whole system would go on indefinitely. He was not finding fault; he was stating facts. A Royal Commission had been granted, and according to the evidence that had been given he believed that Commission would bring about a system by which we should get direct responsibility, and there would be an end of the dreadful things that had occurred, and did occur even at this date.

Sir GEOFFREY HORNEY thought Lord Charles had adequately expressed the feelings of the naval profession. He did not feel competent to criticise a ship on paper any more than many of them would feel competent to criticise the designs of an architect; but as an officer who had served on board ironclads, he would be glad to serve in such ships as they now had before them, because he thought they realised the idea of every naval officer, inasmuch as they were ships of great offensive power. Lord Nelson, on receiving into his squadron a new and fast line-of-battle ship, wrote that he hoped he would soon have the opportunity of using her—but he wanted to know how they were going to use their battle-ships if they had not the speed to bring them into action. He favoured large rather than small ships from the point of view of the concentration of power. In reference to the new designs he expressed the opinion that they were good, and that any admiral would be glad to command such ships.

Sir NATHANIEL BARNABY said that many years ago, during the war that went on between targets and projectiles, he was behind the target at Shoeburyness. He was responsible for the way in which the targets were made and for the thickness of armour, and when he saw them flying to pieces in huge masses, his feeling always was that there must be thicker armour, and still thicker armour. Lord Charles Beresford was of opinion that a 5-in. steel deck was proof against high explosive projectiles, but within the last few days he believed a steel shell, with a very high explosive charge, had burst on the other side of a 6-in. armour plate. But whether that was true or not, it was perfectly obvious that they would be able to get these high explosives through armour which was a good deal thicker than was contemplated in the present designs. With reference to ships of the *Admiral* class, all the naval officers regarded it as of the utmost consequence to have the power to hit their enemy, yet these very same men had no words too bad to apply to ships of that class. Yet the offensive power of ships of the *Admiral* class, and their speed, was very nearly the same as that of the ships at present under discussion.

Captain FITZGERALD said that a great point had been made of the size and cost of these vessels. He supposed the alternative to size and cost would be smallness and cheapness. He could not conceive why seamen should be asked to allow the question of cost to influence them. It had been pointed out that in the old days a seaman had £150 worth of value under him. He wondered if Jack ever thought of that, and whether he ever cared whether it was £150 or £170. Now, it was calculated that every captain of a ship had charge of property to the value of £1,000,000, and that every man had £2,000 worth of stuff under him; but were there not difficulties enough in fighting when the time came, without introducing another element—the element of cost? What did they care about the cost? When they went into action they risked their lives to uphold

the honour of the country and the honour of the Navy, and did they want to put anything else on their backs? And why did they try to frighten them by making them remember the value of these vessels? It was like saying, "Don't go near the shore, and, above all things, don't go near the enemy, because you have under your charge a million of money." The question of cost was to be settled in the House of Commons. Seamen had to defend what was called the British Empire, which was the biggest value out, and they must have the best ships to defend it if they thought it was worth defending, and they must pay the money for the best ships that could be built, and the most expensive ships, which would give them a reasonable chance of defending their property, and not only defending it in their own time, but handing it down to their successors undiminished in its extent, and with its honour unclouded.

Admiral COLONS expressed his belief that the feeling of the Service was entirely clear with regard to the designs of these battle-ships, and taking what the Service asked for all round, they were the fairest, the most open, and the most complete attempt to meet the naval opinion of the day which had ever been undertaken by any naval architect since he entered the Service.

Mr. BYLES criticised the position of the armour in the designs, and

Lord Admiral CLANWILLIAM gave testimony as a naval officer to the general opinion throughout the Service that these vessels were of the right sort, and that they had every confidence in the ability of the officers who gave the instructions to Mr. White to design them.

Mr. WHITE, in replying upon the discussion, said: It had ranged over so large a field that it was not an easy matter to deal with the points raised in anything like a satisfactory manner. The discussion was not one in which the business members, by whom he meant shipbuilders and engineers, were likely to take much part. The points raised in the paper were almost entirely matters affecting what might be called the fighting efficiency of a ship of war. Mr. Byles had criticised the position of the armour, but in the design of these ships protection to all the guns had been most carefully considered and arranged for. This institution had the advantage of a membership which extended throughout the world, and there were present to-day gentlemen representing foreign Governments whom they were most delighted to see, and whose membership of this institution was a great advantage, but he might say to those gentlemen that there were certain things about these ships which he did not propose to tell them, and there were certain things about those ships which he did not think on any account should now be made public. The responsible authority in this matter was the Board of Admiralty, and he wished to make it perfectly clear that although he was the responsible designer of these ships, they were the ships of the Board of Admiralty. He wished to emphasise this, because he did not wish it to be supposed that he approved personally of everything in these ships. It was not his business to approve or disapprove; it was his business to combine in the design the qualities and conditions which the Board of Admiralty, on such advice as the Services behind it gave, said should be combined and embodied in the design. But he came here to-day not to justify himself, but to explain what seemed to him to be some misapprehensions as to what the Board intended, and what it was hoped would be achieved in these ships. With regard to the Board of Admiralty Margin, Mr. White pointed out that a certain conservatism prevailed with regard to the equipment of a ship, and that you got all that had been customary to put in, *plus* all the modern improvements. It was not a matter of course for him to do more than suggest, but he had again and again suggested to the naval authorities whether stock should not be taken and reductions made in some of these things, and something had been done in that direction, and was still being done, but these were small and minor matters as compared with one great fact—that when a ship was completed as designed, when she went on service she would get deeper into the water, as the ships of the *Admiral* class did, by having guns added to them, and as the *Trafalgar* and the *Bellerophon* did, the latter going to sea after 10 or 15 years' service with her armour in anything but the position which her designers intended. The meaning of the Board Margin was this:—It meant that certain additions to a ship would be inevitable, and that if a certain amount of unappropriated weight was allowed for in the design, it could certainly be made use of. So far as the Board was concerned, those considerations were of course complete and clear, but from the

naval architects' view of the matter it became a formidable thing. In a vessel like the *Blake*, which was to steam something like 22 knots per hour, they had to carry something like 350 tons of what was called Board Margin, in addition to 1,500 tons of coal, and it would be seen how tremendously difficult was the problem that arose. What he had endeavoured to make out in the paper was this—that the new ships, with very high speed and very large loads, beside the Board Margin, were made still larger by having to carry 520 tons of Board Margin. By utilising the Board Margin there would be a possibility of carrying 1,400 tons of coal instead of 900, and there would be a possibility of an increase in coal endurance if that should be desired, or there would be the possibility of having the vessels floating at a lower draught than might be thought desirable. But the question of coal endurance was a perfectly distinct one from that. All his remarks on the question of coal endurance were based upon the 900 tons that had to be carried that were included in the low draught, and he contended that these ships would compare favourably, as regarded coal endurance, with ships like the *Thunderer*, *Devastation*, and *Dreadnought*. He trusted that, as the result of the discussions which had taken place, the public would be satisfied on this point—that no pains had been spared to produce what might be regarded as being, under present conditions, the most powerful war ships that the Admiralty had ever ordered.

## CORROSION AND PITTING IN MARINE BOILERS.\*

By J. B. DODDS, Esq., Public Analyst for Hartlepool.

THE question of boiler corrosion and pitting is one that has had the writer's professional attention and consideration for some few years; and although he is somewhat conversant with the many theories and practical explanations so ably propounded in papers read before the various scientific institutions of this country, yet it appeared to him that the chemistry of corrosion as investigated by himself would be of interest to this Institution.

It was not his intention to propound any startling theories, but to lay before the members the simple and plain facts he has observed, and the deductions he has drawn therefrom.

On examination of corroding boilers, those parts seriously affected are generally found devoid of the usual hard, protective, "sulphate of lime" scale, and in exceptional cases the whole of the boiler is perfectly free from this scale, and the various parts covered with a red, or even a black coating of a soft matter, frequently slimy in character. Much of this matter is found on the upper portions of the boiler in the form of a froth, while the rest is deposited on the tubes, combustion chambers, or settles to the bottom of the boiler like mud.

Attention is particularly drawn to the chemical composition of this deposit; the following analyses may be taken as fair averages of the many samples the writer has examined and analysed:—

	Deposited at bottom of Boiler. Per cent.	From top of Boiler. Per cent.
Ferric oxide .. ..	65.00	72.9
Calcic sulphate .. ..	9.02	1.58
Calcic oxide .. ..	.75	1.38
Magnesian oxide .. ..	10.12	8.14
Zinc oxide .. ..	.75	1.35
Sand, etc. .. ..	1.70	1.2
Oily organic acid, combined with the ferric, calcic, and magnesian oxides .. ..	10.66	10.75
Free uncombined oil .. ..	2.00	1.25
Water .. ..	—	1.45
Total .. ..	100.00	100.00

In some cases this oily combined acid has amounted to 20 and even 25 per cent.

On examining these deposits one is struck with the curious fact that they contain a very large percentage of magnesian oxide in an insoluble form, and also with the fact that they contain a very considerable amount of oily organic acid, and that this organic acid is in combination with the ferric, calcic,

and magnesian oxides. The presence of this insoluble magnesian oxide compound at first sight appears unaccountable, and causes us to speculate as to where it comes from, because sea water only contains magnesia as either sulphate or chloride, both of which salts, especially the chloride, are exceedingly soluble, and are not, as sulphate or chloride, capable of forming an insoluble deposit. Indeed, in one gallon of sea water only the 98.7 grains of calcic sulphate and the 2.8 grains of calcic carbonate are capable of forming permanent insoluble deposits on boiling and evaporating. All the other constituents are very soluble, and simple boiling and evaporation, to the extent carried on in a steam boiler, would only make the solution stronger without causing their deposition in an insoluble form—that is, supposing no other influences acted on them at the same time. It may be asked, might not the river waters with which the boilers are filled when in port furnish this magnesia? But river waters do not contain magnesia salts as a rule, but are surface waters containing principally calcic sulphate; therefore this magnesian oxide of the deposits must be derived from the chloride and sulphate of the sea water.

There is also the other fact noticeable in the analyses of these deposits, and that is the very considerable percentage of "oily organic acid" present in combination with the ferric, calcic, and magnesian oxides, and this organic acid is derived from the mineral oil used as "cylinder oil" in the cylinders. It is generally stated that these oils are hydrocarbons, therefore not capable of saponification, and that they do not affect metallic surfaces. This is correct as applied to these oils in their natural state, then alkalies do not affect them or form soaps, nor is copper or other metals tarnished or corroded, even after being immersed in them for a considerable or indefinite length of time; but it is incorrect as applied to these oils, when exposed to the influences and conditions existing in the high-pressure cylinder of an engine working at such a pressure that the temperature is higher than the "vapourising point" of the "cylinder oil" which may be in use. All these oils are capable of oxidation, otherwise they would be incombustible; and placed under sufficiently favourable conditions for oxidation, such as very extended surfaces exposed to the action of steam of sufficiently high-pressure, and therefore temperature, to reduce a portion of the oil to a vaporous state—and these are the conditions existing in engine cylinders, particularly in the high-pressure cylinder of a triple engine—under these conditions these oils will become in part decomposed and broken up, producing compounds different from the original oil put into the cylinder. These compounds pass forward with the steam, and gradually work their way through the condenser into the boiler, and these compounds so introduced into the boiler are capable of combining with bases such as ferric oxide, calcic oxide, or magnesian oxide, as is proved by the constituents of the deposits already mentioned.

Oil merchants and manufacturers will state that their particular oils have a "vapourising point" of over 600 degs. Fah.; it has even been seriously contended that the "vapourising point," or that point when vapours become apparent, is at a higher temperature than is the flash point. The writer has examined very many of the standard cylinder oils, and can say that the majority of them, as supplied to ships, vapourise or show vapour when heated to under rather than over 280 degs. Fah., and flash at under rather than over 450 degs. Fah.

Seeing that 160 lb. pressure is not now considered an extraordinary pressure, and that the temperature of the steam at this pressure is 363 degs. Fah., it is not difficult to imagine that much vapour is given off from such oils when used at such temperature, and as this giving off of vapour indicates the decomposition or change of the oil, the amount of such decomposition may be estimated therefrom.

Having pointed out these two peculiarities, let us take into consideration what it is that takes place in a steam boiler supposing the surfaces of the metal to be unprotected by scale or by artificial means. The salts of the sea water, especially the magnesian chloride, causes the water to act chemically on the exposed metallic surfaces. This chemical action takes place at all temperatures, and in water of all specific gravities, but is greater at a high temperature than at a low one, and also greater the higher the specific gravity or more degrees the water indicates on the salinometer. The result of this chemical action is the oxidation of the exposed surfaces of the iron, but more especially of the steel. This oxidation or chemical action at the same time produces electricity, as chemical action always does. When this oxidation takes place in a cold solution, the electric tension exhibited is slight, even though the

\*Read before the North-East Coast Institution of Engineers and Shipbuilders, in Newcastle-on-Tyne, March 13th, 1889.

chemical action be considerable. Though this tension does appear slight so far as instruments show it, yet in fact the amount of electricity produced is proportionate to the amount of chemical action; but as both the metal and the water are conductors and remaining in contact, the greater part of the opposite electricities produced recombine and neutralise each other as fast as they are separated. But if this chemical action or oxidation takes place at a high temperature, as in a steam boiler, this recombination does not take place to the same extent, and the salts of the sea water become electrolysed or decomposed by the electricity, their bases combining with the "oily organic acid" produce the deposits found in the corroding boiler. As these bases of the sea water combine, and are neutralised by these "oily organic acids," there is liberated an equivalent amount of the acid of the sea water salt, which helps to still further increase the corrosion.

These reactions take a considerable amount of time to state, but in fact they all take place nearly instantaneously, and this, the writer considers, is the reason why corrosion is attributed to electric action, whereas really the electric action in a steam boiler is due to the chemical action of the water on the metal of the boiler.

A voltaic couple which may consist of, say a plate of zinc and a plate of copper immersed in a bath of dilute sulphuric acid, the two plates being connected outside the liquid by a wire, chemical action is set up, and electricity produced in exact proportion to that action. The chemical action causes the electricity, not the electricity the chemical action. The same state of things exist in a steam boiler, there is corrosion or oxidation of the iron or steel exposed surfaces by the sea water, instead of the corrosion of the zinc plate by the dilute sulphuric acid. The sea water acting in its degree as the exciting liquid to produce chemical action and so electricity.

There are two ways of stopping this corrosion, one by rendering the water non-exciting, and the other by taking advantage of a law or fact observed in electricity, which is—that when two elements or metals of dissimilar characters are immersed in a liquid capable of chemically acting on one or both of them, and are at the same time connected together by means of a metallic connection, that element or metal which is most acted on by the exciting medium, becomes the positive or corroded element, while the other becomes the negative or inactive element, and so escapes all corrosion so long as they are in metallic contact.

When it is wished to stay corrosion by taking advantage of this electrical fact, the usual method is to employ metallic zinc, being careful to bring it into intimate metallic contact with the metal of the boiler. This will, if sufficient zinc be used, have a beneficial effect; still too much is generally expected from the zinc; engineers expect the effect of these zinc plates, say four of them, weighing in all about 56 lbs. and placed in different parts of the boiler, which will weigh about 30 tons, to influence the whole and every part of the boiler, and to continue to influence it for a period of time. Even if these plates were most elaborately connected in strict metallic contact with the metal of the boiler in its different parts, it is too much to expect from such a quantity of zinc, there being too great a disproportion between the weight of 30 tons and 56 lbs., therefore the areas of its influence must be circumscribed, more especially after being in use a few days, when its surface becomes coated and protected against a great proportion of the corrosion it ought to undergo to enable it to keep its place as the most readily acted on metal, and absorb to itself the chemical action or corrosion which would otherwise attack the iron or steel of the boiler. This idea that the areas of influence of the protective plates are circumscribed to some extent accounts for the fact that a boiler shows signs of corrosion sometimes in one place and then in another; in other words, it shows these signs over areas where the protective influence of the zinc has either been destroyed, or too much diminished to be effective.

56 lbs. of zinc represents .083 per cent. of the weight of 30-ton boiler, if from four to five times this amount were used in the first instance, and supplemented from time to time, as it was corroded and rendered ineffective, it would be found that corrosion would be stayed, though there would be considerably more than a proportionate quantity of zinc consumed in a given time than when the smaller quantity was employed. The reason for this larger consumption of zinc being that though zinc in proper metallic contact absorbs all corrosion ~~itself~~, it does not destroy or prevent the chemical action, or

ulting electricity being formed in the boiler, it rather

increases it. As has already been stated, the action of the zinc is simply that being the most readily acted-on metal it becomes the positive or corroded element instead of the iron, as would be the case were the zinc not present and in metallic contact. This being the case it may be unnecessary to point out the advisability of the zinc used being good and as pure as possible. Any foreign metals the zinc may contain will injure its efficiency as a protector to the metal of the boiler, as part of its power will be wasted in becoming positive to them instead of to the boiler.

It would certainly seem that the most logical method of preventing corrosion is to make the water non-exciting or incapable of acting chemically on the iron or steel of the boiler; thus the cause is at once attacked, whereas the other method only deals with the effect, and there is moreover avoidance of the great difficulty in making and maintaining the metallic contacts, owing to corrosion at the point of juncture, or the breaking of the contacts from other causes, and such imperfections can only be remedied when the boilers are opened. In those methods which aim at destroying the corrosive or exciting power of the sea water, the protective agent is added either at the condenser or hot-well from time to time, and in greater or less quantities as desired. There are several ways of making or causing the sea water to be non-exciting, and there are many compounds offered as meeting all the requirements, but care should be taken not to put into boilers any compound which contains a constituent that, of itself, is capable of combination with iron, or which contains a constituent that can by any means be made to furnish compounds capable of such combination, because it should be a *sine qua non* that the protective agent should be in itself harmless. Lime preparations added to the water are beneficial, their action being to keep the surfaces of the boiler always coated and thus protected from corrosive action. This subject has occupied so much of the writer's professional attention that it has caused him to take more than an ordinary interest in the solution of the problem, apart from any commercial consideration of the question, although he felt it would be a great advantage if some reduction could be made in the present costly application of zinc, and the writer is of opinion that a basic solution of zinc would effect this economy, but, after all, he assumes that the vitality of the boiler is the first consideration.

The great advantages in the use of such anti-corrosive or anti-exciting compounds is that they can be introduced in small quantities at stated intervals. They render the water non-exciting, and diffuse themselves through all parts of the boiler, thus protecting all parts equally.

In treating of corrosion, mention of that special kind generally known as pitting, has been omitted. This pitting is occasioned by the same causes as induce the more general corrosion, but these causes are intensified and accelerated by two other influences, which tend to concentrate the effects of such corrosion by rendering it very local instead of general. These influences are rust or iron scale, and variations of temperature. Rust or iron scale, is frequently, indeed generally, in the form of "magnetic oxide of iron," and when the metal of the boiler, especially if it be steel, is acted on chemically by the sea water, and whilst in intimate contact with this oxide, such chemical action induces electricity, the oxide and the metal in its very immediate neighbourhood constitute a voltaic couple, the metallic iron or steel being the most readily acted on becomes the corroded or positive element, while the oxide becomes the inactive or negative one; this couple induces a current of electricity having only a very local influence, thus concentrating the action on that limited portion of the iron or steel which has become the positive or corroded element through the influence of the oxide or scale, instead of allowing that action to expend itself more generally over a larger area.

Variation of temperature affects more particularly the question of the very serious and dangerous pitting observable on the sides of the furnaces. In cases where two portions of even the same plate of iron or steel are subjected to unequal temperatures when immersed in a liquid capable of chemically acting on them, these two portions become virtually two different metals so far as molecular arrangement is concerned, and are capable of forming a voltaic couple; the more highly-heated portion, being the most readily chemically acted on by the sea water, becomes the positive or corroded element, while the less highly-heated portion, being also the less liable to the chemical action, is the negative or inactive one. Thus, when through any physical or structural cause, one part of the metal

becomes more highly heated than another part—and portions of the furnaces and combustion chambers are very liable to this, especially along the fireline—this more highly-heated portion becomes positive to the less highly-heated portion, and thus concentrates on itself all the corroding or chemical action which would have diffused itself more generally over the whole surface had the temperatures been equal.

To counteract or stay this pitting is much more difficult than it is to stay the general corrosion. In the case of general corrosion there is a general cause which may be met by a general cure, but in the case of pitting there are several causes, each perhaps similar, but yet each requiring to be separately neutralised and overcome. Each case of pitting being due to a local and not a general cause, in any endeavour to effect this cure by means of metallic zinc it will be necessary to remove this cause and bring the part affected into intimate metallic contact with the metallic zinc. Bringing the zinc into this contact with these parts will very greatly increase the consumption of zinc, seeing that these parts are so prone to chemical action. Supposing the causes, such as rust or iron scale, and the variations of temperature to be removed, this increased use of zinc will be effective. But though it may be possible to remove the rust, it is not so possible to do away with the variations of temperature; therefore the best method of effecting a cure of this pitting would be to strike directly at the cause by rendering the water non-exciting. By this means the rust and the variations of temperature are rendered innocuous.

In conclusion, the writer would point out that prevention is better than cure, and that if it is desired to keep a boiler in good order certain precautions must be taken. Firstly:—great care must be taken in the selection of cylinder oils, and only use such as have a vapourising point at a higher temperature than the temperature of steam at the pressure at which the boiler is worked, and do not take the statement given of the vapourising points of these oils for granted, even though it may be a certain brand or make, but see that each particular lot as supplied is equal to the sample and bears out all the statements made respecting it and which influenced its purchase. Such supervision will always give a good return for the trouble, because whether it is cylinder oils or any other goods that are sold and which are not subjected to this supervision, it may be taken for granted that the lowest quality accepted without serious complaint or rebate in price will eventually become the highest quality that will be supplied.

Secondly, work the boiler with the greatest amount of regularity practically possible on board ship, and endeavour to keep the specific gravities of the water as regular as possible. Samples of these waters might be taken at stated times during the voyage, and of deposits whenever opportunity offers; these samples to be kept for examination when necessary. The taking of these samples answers two good purposes, one is, that if the boiler should happen to show signs of corrosion, these samples will enable the cause of such corrosion to be traced. The other purpose is that by taking samples systematically and for a certain purpose, the attention is thereby drawn to the boiler and a certain interest created, which induces regularity in working and treatment generally, and all means which have this effect are most valuable, and cause a very material reduction in the wear and tear of the boiler.

### THE PROTECTED CRUISER "BARROSA."

ON April 16th, the *Barrosa*, the keel plate of which was laid at Portsmouth on the 14th of May, 1888, was floated out of No. 4 Dock, the christening ceremony having been performed by Miss Gorst, daughter of Sir John Gorst, M.P. The *Barrosa* is the first of four third-class protected cruisers of the improved *Buzzard* class, and was built from designs by Mr. W. H. White, Director of Naval Construction. Two of these vessels, the *Blanche* and *Blonde*, are building at Pembroke, and the fourth, the *Barracouta*, at Sheerness Dockyard. These, the "B" type of cruisers, are intended for distant service on stations where docking accommodation does not exist, or may not be available in time of war, so that their hulls are sheathed with wood and coppered. The *Barrosa* measures 220 ft. in length and 35 ft. in beam, and has a mean draught of 14 ft. The weight of hull is 853 tons, of which 690 tons have been worked into the structure. The total load displacement is

1,580 tons. As in the case of the *Beagle*, which was recently floated out of dock at the same dockyard, the *Barrosa* has been constructed with a steel bottom, protected with only a single thickness of wood, for carrying the copper sheathing. The stem, sternpost, and shaft brackets are manufactured of phosphor bronze, and were cast in the yard. A watertight protective deck extends throughout the ship, having a maximum thickness of 2 in. (over vitals) and a minimum thickness of an inch. It is fitted about 18 in. below the water line forward and aft, but rises higher over the machinery spaces, and forms, both at the sides and ends of the spaces, a sloping deck, for greater defence against shot and shell. The amount of coal carried is 160 tons, and the fuel is so arranged as to afford additional protection over this deck. The whole of the frames and bulkheads are connected by brackets and angle steels to the protective deck, and as few openings as possible are made in it. But, where openings are unavoidable, armour shutters or gratings have been fitted. Additional security against sinking has also been afforded by a middle-line longitudinal bulkhead, which is continued throughout the greater part of the vessel's length, and by means of numerous transverse bulkheads, subdividing the vessel into small compartments. An oval conning tower, formed of steel plates three inches thick, confers a certain amount of protection against small gun fire on the various steering and engine-room telegraphs, voice pipes, and steam steering wheel. The contractors for the machinery are Messrs. Palmer & Co., of Jarrow-on-Tyne, who are to supply engines of the vertical triple-expansion type, with boilers of the ordinary return tube character, to develop a collective I.H.P. of 2,000 under natural draught and of 3,000 with forced draught. Under the former condition the speed at the load line is expected to be 15 knots and under the latter 16½ knots on the measured mile. With her normal coal capacity the ship will steam a radius of 3,400 knots at a ten-knot speed. Her armament will consist of six 4.7 in. breech-loaders on the broadside, and four 3-pounder guns, two at the bows, having a wide range of fire, and two on the quarters, having direct stern fire. She will also be equipped with a brace of Nordenfelt machine guns and two torpedo tubes. Among the novelties introduced into the *Barrosa* are the arrangements for the storage of portable water, which, instead of being contained in tanks, is stored in transverse chambers forming part of the structure of the hull. Her complement of officers and men is 151. The original estimate of cost (exclusive of guns) was £89,693, but the revised estimate shows a reduction of £3,000, and, if £4,884 be added for the armament, the total cost of the *Barrosa* will be £91,577.

### LLOYD'S REGISTER SHIPBUILDING RETURNS.

From the Returns compiled by Lloyd's Register of Shipping, it appears that there were 528 merchant vessels of 920,989 tons gross under construction in the United Kingdom at the close of the quarter ended 31st March, 1889. The particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1888 for the purpose of comparison:—

DESCRIPTION.	Mar. 31, 1889.		Mar. 31, 1888.	
	No.	Gross Tonnage.	No.	Gross Tonnage.
STEAM.				
Steel .. .. .	366	790,509	259	517,814
Iron .. .. .	68	35,018	36	19,395
Wood and Composite ..	5	268	7	1,735
Total .. .. .	439	825,795	302	538,944
SAIL.				
Steel .. .. .	40	77,780	20	33,976
Iron .. .. .	9	14,181	13	17,275
Wood and Composite ..	40	3,233	45	4,231
Total .. .. .	89	95,194	78	55,482
Total Steam and Sail ..	528	920,989	380	594,426

Comparing the present returns with those for the quarter ended 31st December, 1888, an increase is observed in the

vessels under construction of 83 vessels of 109,521 tons; and there are now 181 vessels of 333,855 tons for the construction of which preparations are being made, against 171 vessels of 318,730 tons "preparing" at the close of the previous quarter.

It should be added that, of the vessels under construction in the United Kingdom at the end of March, 454 vessels of 829,152 tons, or above 90 per cent., were being built under the supervision of the surveyors of Lloyd's Register with a view to classification by that society.

The following details concerning the vessels included in the foregoing statement are necessary in order to properly represent the shipbuilding work of the past three months:—

During Quarter ended Mar. 31, 1889.	STEAM.		SAIL.	
	No.	Gross Tonnage.	No.	Gross Tonnage.
Vessels commenced ..	159	257,875	22	25,844
Vessels previously commenced but not progressed with ..	7	2,706	6	462
Vessels launched ..	108	199,798	21	21,985

It will doubtless be of interest to give the total figures for vessels under construction at the principal shipbuilding centres of the country now, as compared with those of the same period last year.—

DISTRICT.	DESCRIPTION.	Mar. 31, 1889.		Mar. 31, 1888.	
		No.	Gross Tonnage.	No.	Gross Tonnage.
Belfast and Londonderry	{ Steam ..	19	69,612	19	65,382
	{ Sail ..	4	4,125	3	5,430
	Total ..	23	73,737	22	70,812
Clyde .. ..	{ Steam ..	117	243,078	98	170,269
	{ Sail ..	28	54,581	16	27,900
	Total ..	145	297,659	114	198,169
Mersey .. ..	{ Steam ..	16	27,411	10	17,898
	{ Sail ..	7	13,215	8	5,335
	Total ..	23	40,626	18	23,233
Tees .. ..	{ Steam ..	50	106,034	28	60,714
	{ Sail ..	1	2,860	1	90
	Total ..	51	108,894	29	60,804
Tyne .. ..	{ Steam ..	80	164,378	55	114,916
	{ Sail ..	..	..	..	..
	Total ..	80	164,378	55	114,916
Wear .. ..	{ Steam ..	57	120,985	40	84,185
	{ Sail ..	3	4,106	1	1,880
	Total ..	60	125,091	41	85,565

Lloyd's Register of Shipping,  
2, White Lion Court, Cornhill, E.C., April, 1889.

### THE TWIN SCREW SLOOP "BASILISK."

ON April 6th the new twin-screw sloop *Basilisk*, which has been built at Sheerness from the designs of Mr. W. H. White, was floated out of dock. The christening ceremony was performed by Miss Lethbridge, daughter of the Commander-in-Chief at the Nore. The engines of the *Basilisk*, which are to indicate 2,000 H.P., are on the triple-expansion principle, carrying steam of 145 lb. pressure in the boilers, and are being supplied and fitted by Messrs. J. & G. Rennie, (Limited). The *Basilisk*, which has been 11 months building, is sister ship to the *Daphne*, launched at Sheerness a year ago; but a new departure has been made in her construction. The *Daphne* was built composite fashion, her steel frames being covered with two thicknesses of teak. The frames of the *Basilisk* are completely plated with steel, which is covered with one skin of teak sheathing,  $3\frac{1}{4}$  in. thick, extending 2 ft. above the water line, and secured to the plating. Metal stem and posts have been used instead of wood, as in the *Daphne*. Principal dimensions are as follows:—Length, between

12 ft. 5 in.; displacement at load draught, 1,170 tons. The *Basilisk* is unarmoured, but her machinery is protected by a steel deck, extending over her engine and boiler compartments. She possesses storage accommodation for 160 tons of coal—a supply sufficient to enable her to steam 930 knots continuously at full speed, and 8,000 knots at a reduced speed of 10 knots per hour. She is to realise a speed of 14.5 knots under forced draught, and 13 knots under natural draught. The armament of the *Basilisk* will consist of eight 5-in. steel breechloading guns, six Nordenfelt machine guns, and two Gardner machine guns. She will have a complement of 131 officers and men. The total cost of the *Basilisk* when fully equipped and ready for sea, is estimated at £72,565.

### THE UNIVERSAL SELF-CLEANSING FILTER.

ON a recent visit of inspection to the offices, at 108, Fenchurch Street, E.C., of the Universal Self-Cleansing Filter Co., we were shown all the leading types of this now popular filter at work, and judging from the practical demonstrations then made, we can unhesitatingly state that the self-cleansing filter is one which will satisfactorily deal with every demand that can reasonably be made upon its filtering qualifications.

As the title implies, this filter is not only capable of depriving the liquid passed through it of all impurities, but it is also provided with a very simple and very efficient means of thoroughly cleansing itself.



FIG. 1.

This will be seen from Fig. 1 of the accompanying illustrations. The supply of water entering at A is drawn off as filtered water, after passing through a cylindrical block of filtering material, at the tap B, the length of time during which pure filtered water may be drawn off varying of course with the state of the water to be filtered. When it is desired to cleanse the filtering medium, the tap B is closed and the tap C opened. If now a full head of water is allowed to enter at A, it will not only thoroughly cleanse the filtering medium, but will also swirl out every particle of dirt from the filter casing, etc., and leave the filter

in every respect equal to a new one. The outer casing of the filter shown in Fig. 1, is made of a pure white metal, but the form of filter which, if we may use a homely expression, "took our fancy" most is the one represented by Fig. 2, the body whereof is made of glass, and so allowing of the action and condition of the filter being always open to inspection.

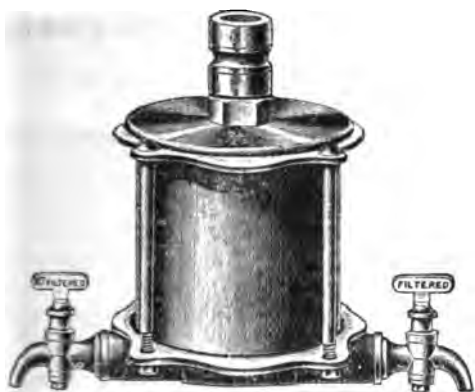


FIG. 2.

We may here state that the form shown at Fig. 1 is fitted on board the Australian mail steamers of the Orient and Pacific lines, and in every case it has given unqualified satisfaction.

In the British India Steam Navigation Co.'s s.s. *Golconda*, a self-cleansing filter is placed in the galley, and pipes leading to the pantry over 100 ft. away, allow of a constant supply of pure filtered water being obtained.

The operation of filtering can be started or stopped at once by simply turning on or off a stopcock, and after the syphon has been set in action the whole apparatus requires no attention.

The feeding end of the syphon pipe being flexible, it accommodates itself to the rise or fall of tidal rivers. The delivery end of the syphon has a ball cock fitted to it, so that although the pure deposited water is drawn off from under it, the syphon is always left ready for immediate action.

A large variety of these filters have been made, those of the open top, or no pressure type, filtering under the ordinary conditions, while others are made to with-

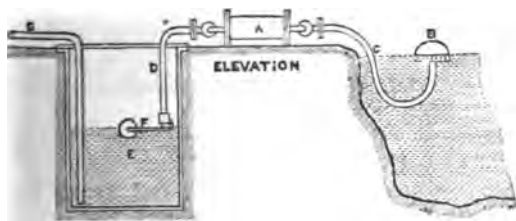


FIG. 3.

stand, and efficiently filter under pressures reaching to 100 lb. per square inch.

Everybody who studies his health knows the value of filtered water as a health preserver, but few seem to appreciate the value of pure filtered water for steam generating purposes. The company have, however, designed and constructed a special form of self-cleansing filter for dealing with large quantities of water such as would be required for steam boilers.

In this arrangement the filters are so placed that

they may be fed by gravity and deliver the filtered product into a pure water tank, or they may be made of the high-pressure type, in either case the filters being so grouped and connected to the supply and delivery pipes as to allow of any of them being shut off for cleansing purposes, while the others continue delivering a stream of pure, filtered water.

This arrangement is shown in Fig. 3, here the filter A of the gravity type, is shown connected to the perforated rose float B by the flexible connection C, while the filtered product is supplied to the pure water tank E by the syphon pipe D controlled by the float F, the filtered water being drawn from the tank by the pipe G.

### REFRIGERATOR BARGE.

THE accompanying illustration represents a novel departure made by the London and Tilbury Lighterage Co., Limited, who have, comparatively recently, had a number of cold-storage barges fitted up for them by the Pulsometer Engineering Co., Limited, London.

We need not enter fully into the figures to prove the enormous increase which has occurred in the last few years in the importation of frozen meat, nor need we point out the fact that, as received from the importing vessels, its quality leaves little to be desired, but we would urge upon our readers not to lose sight of the fact that if this meat is to be placed before the consumer in its prime condition, other means than those ordinarily employed must be devised for its conveyance from the importing vessel to the cold stores and so to the retailer.

Though we have alluded to the London and Tilbury Lighterage Co.'s barges as a "novel" departure, it is, strictly speaking, rather an accomplished fact than a novelty, as quite a fleet of these barges have been plying upon the Thames for nearly twelve months now, during which period they have conveyed many thousands of tons of frozen meat, all of which has been landed in good condition, and frequently at lower temperatures than when discharged from the importing vessels, and, needless to say, the meat so conveyed has realised the best prices when put upon the market.

As will be seen from the illustration, the barges are entirely independent of the source of refrigeration, and can be attached thereto or separated therefrom without any difficulty or loss of time. Each barge has a capacity equal to about 50 tons of meat, is provided with doors at each end for loading and unloading, and is roofed in and insulated in a similar manner to the cold chambers of ocean steamers, the insulation in this case consisting of charcoal placed between double thicknesses of wood lining, with felt and Willesden paper intervening, and specially-arranged air-spaces. In the roof there is a coil of pipes connected by stop valves to an inlet and outlet main passing athwart the barge and having swivel connections at each end. Any number of barges may be coupled together from these swivel connections by means of insulated flexible hoses fitted with swivel unions, or flanged connections, the hoses providing for any difference in motion between the barges and allowing of their being towed or riding at their moorings without straining the connections.

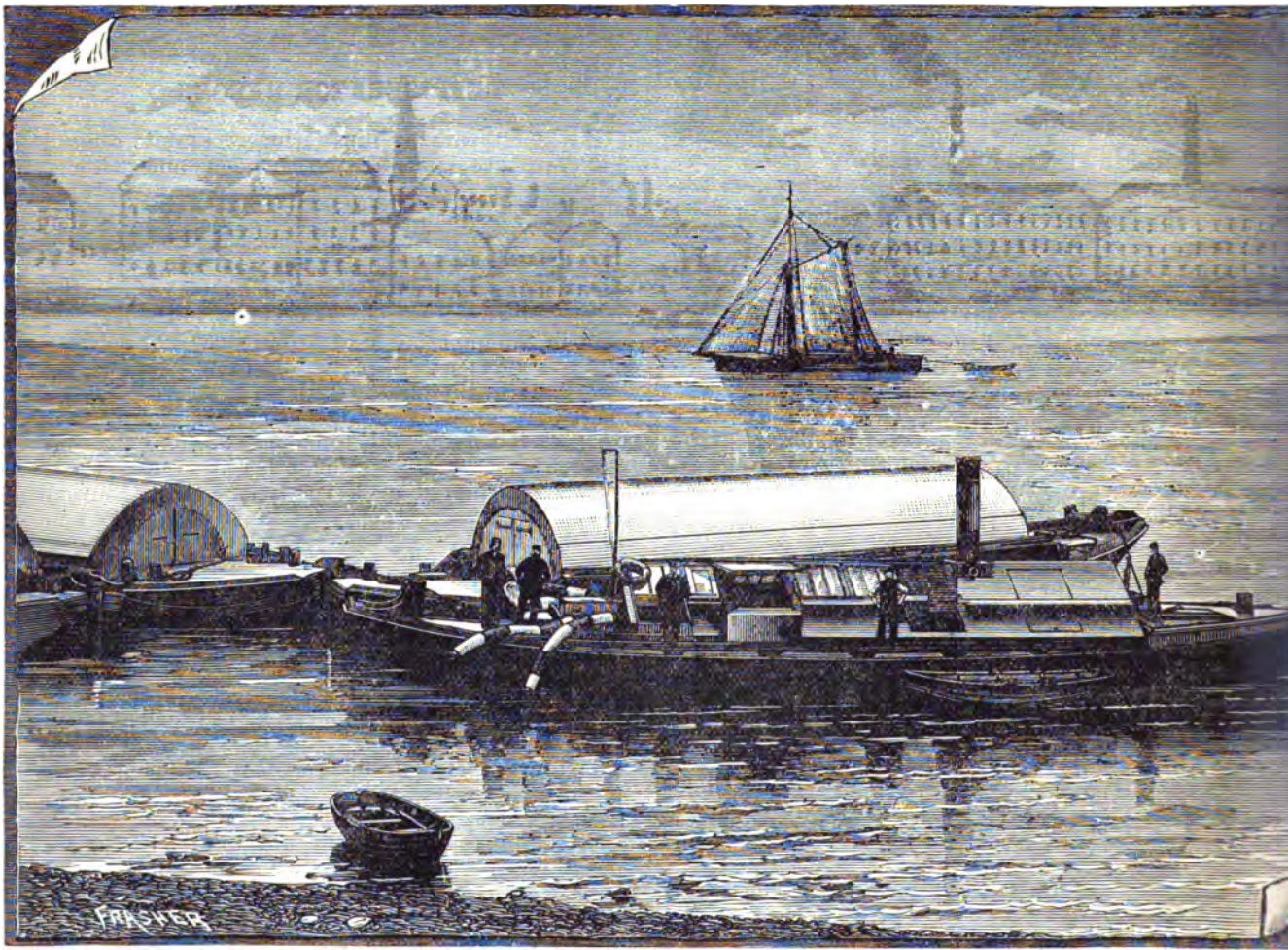
The cold-producing machinery is fixed, as shown,

upon a separate barge, and consists of one of the Pulsometer Engineering Co.'s refrigerative freezing machines, on Puplett's patent ammonia compression system, wherein a multitubular refrigerator, a horizontal double-acting compression pump, a multitubular gas condenser, and the necessary circulating pumps are used. A vertical compound engine, with surface condenser; and an ordinary multitubular boiler, with a single furnace, produce the motive power.

The *modus operandi* is as follows:—A strong solu-

cold brine left in the pipes in each barge, when it is disconnected from the refrigerator, is sufficient to maintain the barge at a low temperature and preserve the cargo in good condition for a considerable period; in practice it takes several days for the temperature to rise above the freezing point. The atmosphere in the barges is perfectly clear and free from snow, any moisture generated being deposited upon the pipes in the roof, but the quantity is so trifling that these are seldom quite white.

When in full work the whole apparatus is operated



tion of chloride of calcium is reduced by the apparatus to a temperature of about 10 degs. (Fah.) below zero, and is circulated through the flexible hoses and the coils in the roofs of the different barges, taking up the heat and reducing them to the desired temperature; it is then returned to the refrigerator to be re-cooled. The entire arrangement is constructed under Williams' and Puplett's patents, and is such that one or all the barges can be cooled at the same time, and any barge detached as required.

The machinery is designed to cool each barge to a temperature below 20 degs. (Fah.) in about an hour-and-a-half, and it is capable of cooling and maintaining at that temperature six barges, having a total capacity of about 300 tons of meat. The quantity of

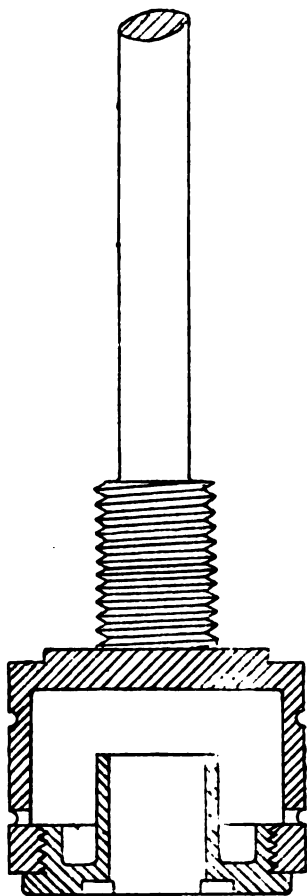
by two men, and the consumption of fuel does not exceed 84 lbs. of coal per hour.

The regenerative freezing machine, on the same principle as the machinery used in the floating installation we have just described, has been successfully at work in the Argentine, Chili, Egypt, India, Java, etc., etc., and references can be given to the proprietors of ice factories, who will state that the cost of making ice, extending over several years, has not exceeded 2s. 6d. per ton for fuel, wages, and chemicals, whilst the cost of repairs has been *nil*. A very important advantage of these machines is that the output is not effected by the temperature of the condensing water, the machines producing the full guaranteed quantity with water at 93 degs. without extra cost.

**AN IMPROVED INDICATOR PISTON.**

A SIMPLE method of efficiently lubricating the piston of a steam indicator has long been required, and with the high pressures and consequent high temperatures now in use, it is absolutely necessary that the indicator pistons should be lubricated in order to get correct diagrams.

The device which we illustrate seems to meet every requirement in a very effective manner. It will be seen that an internal reservoir is formed in the body of the piston, so that the steam pressure which acts on the piston also acts on the surface of the lubricant, which is by this means forced through small outlets



into a groove formed on the outer surface of the piston. Not only is the piston continuously lubricated, but the oil under pressure in the grooves forms a packing which prevents dirt or other impurities passing the piston and causing imperfect diagrams. It will be easily understood by those who have had practical experience in the taking of diagrams, that this device reduces to a minimum the chances of a failure through the indicator-piston "sticking" at a critical moment, such as when on the measured mile, as well as giving a more correct indication of the power developed by the engines.

In an ordinary Richards indicator fitted with this piston, one charge of oil suffices for taking about 24 consecutive diagrams.

The inventor of the piston is Mr. D. B. Morison, of Hartlepool, and the makers are Messrs. Elliott Brothers, the well-known opticians.

**INSTITUTION OF MECHANICAL ENGINEERS.**

THE Ordinary General Meeting, of this Institution will be held on Wednesday evening, May 1st, Thursday evening May 2nd, and Friday afternoon May 3rd, at 25, Great George Street, Westminster, by kind permission of the Council of the Institution of Civil Engineers. The chair will be taken by the President, Charles Cochrane, Esq., at half-past seven p.m. on Wednesday and Thursday evenings, and at half-past two p.m. on Friday afternoon. The President will deliver his Inaugural Address on Wednesday evening. The following papers will be read and discussed, as far as time permits:—

Research Committee on Marine-Engine Trials: Report upon Trials of the s.s. *Meteor*; by Professor Alexander B. W. Kennedy, F.R.S., Chairman.

Description of an apparatus for drying in vacuum; by Mr. Emil Passburg, of Breslau. Communicated through Mr. Samuel Geoghegan, of Dublin. (Friday afternoon.)

The Anniversary Dinner will take place on Friday evening May 3rd.

Report upon Trials of the s.s. *Meteor*. By Professor Alexander B. W. Kennedy, F.R.S.:—Description of steamer, and engines and boilers. Object of trial. Coal measurement, and chemical analysis. Furnace gases. Feed-water measurement. Power measurement. Duration of trial. Quantity of fuel used; analysis of furnace gases. Temperature and weight of feed-water. Speed. Mean pressures in boilers, jackets, and receivers. Mean pressures in cylinders, and I.H.P. Boiler efficiencies; engine efficiencies; total efficiency. Steam in cylinders and jackets as measured from indicator diagrams. Coal consumption. Speed of vessel. Supplementary trial of engines driven at full power with forced draught. Trial with engines reversed, going astern. Staff of observers.

**NAVAL ENGINEER APPOINTMENTS.**

The following appointments have been made at the Admiralty from March 25th to April 24th, 1889.

Allen, Jos. W., chief engineer to the *Daphne*, to date May 2nd.

Alton, George B., chief engineer to the *Indus*, additional, re-appointed on promotion, to date April 1st.

Edwards, Robt. W., chief engineer, has been appointed to the *Excellent*, additional, to date March 26th.

Edwards, Robt. W., chief engineer to the *Barham*, to date April 26th.

Evans, Henry A., engineer to the *Pheasant*.

Galpin, Jos. R., Engineer to the *Pheasant*, to date April 24.

Griffin, Daniel, engineer to the *Ranger*.

Kingsworth, Arthur F., assistant engineer to the *Daphne*, to date May 2nd.

Legate, James, fleet engineer to the *Excellent*, additional, to date April 10th.

McCarthy, John, chief engineer to the *Excellent*, additional, to date April 6th.

Moysey, John, staff engineer to the *Excellent*, to date April 6th.

Murdoch, John, fleet engineer to the *Excellent*, to date April 6th.

Slade, John H., chief engineer to the *President*, additional for Royal Naval College, re-appointed on promotion, to date March 26th.

Thomas, Elijah, engineer to the *Research*, to date April 24th.

Thomsett, Frank D., assistant engineer to the *Asia* for the *Anson*.

Watt, Andrew, fleet engineer to the *Assistance*, to date April 11th.

## HOAR & BROWN'S HARDWOOD MARKET REPORT, April 24th, 1889.

**TEAK.**—The deliveries for the four weeks ending the 19th April were 1,408 loads, against 1,156 loads for the same period last year; and for the three months of the year they were 3,712 loads against 4,808 loads in 1888, and 2,369 loads in 1887.

The stocks at the end of March stood as follows:—

	1889.		1888.		1887.	
	Logs.	Planks.	Logs.	Planks.	Logs.	Planks.
Moulmein	2,617 Lds.	488 Lds.	6,287 Lds.	409 Lds.	6,867 Lds.	628 Lds.
Rangoon	1,755 "	894 "	1,255 "	176 "	1,621 "	189 "
Bangkok	178 "	161 "	708 "	48 "	2,988 "	712 "
Totals	4,550 Lds.	1,088 Lds.	8,248 Lds.	688 Lds.	11,496 Lds.	1,594 Lds.

It will be seen from these figures that the present stock is much below the standard average, nor do we see any prospect of it being increased; and if increased by the arrival of one or two cargoes shortly, the wood will be firmly held for good prices.

Forward business is most difficult to negotiate, and shippers are holding for prices that may have to be paid later, but which buyers refuse to acknowledge while the stocks at the various ports are ample for present needs.

The future of the teak market will not be determined until the Admiralty requirements are definitely known, but there can be little doubt that the present advanced prices will be maintained for some time to come. We hear of steamers having been fixed for June and July loading, and this is the disquieting feature; although, if shippers act with discretion, the present satisfactory position of the market will not be disturbed, as the demand, both from home and abroad, will be very considerable as the season advances.

**GREENHEART.**—The market is very firm, but enquiries are scarce. The stock is 190 loads against 1,285 loads in 1888, and the deliveries for the month were 66 loads.

**MAHOGANY.**—There is little new to report. Business has been very quiet, and we do not look for any change at present.

Stocks have been increased by the arrival of a steamer cargo from Honduras, one from Minalitlan, and one from Laguna.

Importers are very firm in their ideas of prices, and to show their confidence they are disposed to hold the wood back, simply bringing it forward as it is required.

As the wood now in stock is mostly of prime quality, we fully anticipate it will realise high prices.

**CEDAR.**—All the old stocks are now in the hands of consumers, and until the new wood is ready for sale there will be nothing to report.

**AMERICAN WHITEWOOD.**—Business has been fairly brisk in boards, and the recent heavy imports leave the stock ample for present requirements.

The stock of logs is now very small, and the enquiries few.

**AMERICAN WALNUTWOOD.**—Logs still continue depressed, and there is no advance in price. The business in boards has been very considerable, and enquiries are numerous. Prices are well maintained.

**SEQUOIA.**—The deliveries have been fairly good, and stocks are being considerably reduced.

The improvement which the hardwood trade experienced during the first quarter of the year has been fully maintained.

## INDUSTRIAL AND TRADE NOTES.

### THE CLYDE AND SCOTLAND.

**L**AST month's notes contained references to the troubles which Clyde builders and engineers were experiencing from the unsteadiness and exorbitant wages demands of the ironworking section of their employees. These troubles have not diminished but increased with time, and strikes have been the order of the day. Not only wages demands, but frequently the oddest of circumstances have been made the occasion for strikes, such as the employment of a manager or foreman not to the liking of the strikers, the kind of rivet-heating fuel supplied, &c., &c. All the districts and almost every individual firm have been affected, but seemingly the Greenock and Port-Glasgow have had most cause of complaint. Mr. Maitland, in response to a letter received

from the Greenock and Port-Glasgow Shipbuilders' Association, the executive of the workmen's own society—the Boilermakers and Iron Shipbuilders'—have addressed a strong appeal to the Greenock and Port Glasgow branches of that society on the subject of the unsteady habits of the workmen. Stopping off work through drinking is, the executive declare, "the greatest evil that our trade and the society has to contend against, and, unless speedily checked, it is certain to inflict much mischief on all concerned. On all hands and from all parts we are receiving daily complaints from employers, managers and foremen over the sad losses incurred by this evil practice. In addition, our own members are ruining the trade. Masters cannot fulfil the contracts they have on hand in the specified time; they are compelled to increase their apprentices or put on carpenters or other upgrown men—in fact, anyone who will do the work for them." So convinced is the executive of the justness of the employers' complaints that they say, "For the purpose of mitigating this great and growing evil, and dealing with members who thus bring discredit on the society and injure their employers, the Council unanimously decided to appoint a committee of seven members from the Greenock and Port Glasgow branches for this special purpose, and to deal with offenders under the 2nd section of Rule 43. The Committee will be under the control of the Executive Council, and receive instructions from them." Some weeks ago an Association of Employers was formed, mostly all of the firms on the Clyde having joined it—and it is hoped that as the organisation gets perfected, and the policy followed has had time to take effect, the relations between masters and workmen may be less characterised by disputed demands and resultant strikes. Consistent with the principal idea, the members of this Association have been meeting with the workmen to arrange scales of wages and other such matters. In the future, therefore, the probability is that strikes will be few, for one of the principles of the Masters' Association is to work amicably with the trades unions, and stated meetings are to be held between representative committees of the two organisations, to consider trade questions and the condition of the industry.

Several very large sailing ships of the four-masted type have been recently built by Messrs. Russell & Co., of Port Glasgow, for various owners, and it is now understood that this firm have booked the contract for what will be far and away the largest sailing vessel afloat. The new ship is to be of steel, to have five masts, and to carry 6,000 tons deadweight. She is contracted for by Messrs. D. Bruce & Co., Dundee, on behalf of Messrs. A. D. Bordes & Sons, of Bordeaux, who already own a vast fleet of sailing ships and steamers.

Since the 25th of March the following new contracts have been entered into by shipbuilders and engineers on the Clyde. The Greenock Steam Shipping Co. have ordered a steamer of about 3,000 tons from Messrs. Caird & Co., Greenock (a similar vessel has been given by this company to an East Coast of England firm). The London and Glasgow Engineering and Shipbuilding Co., Limited, of Govan, have contracted with the Anglo Chinese Shipping Co. to build and engine a steel steamer of about 2,000 tons. Messrs. Fleming & Ferguson, Paisley, have received orders to build a steel screw steamer for a firm in the North of Scotland, and to construct, for a vessel now building for Messrs. MacBeth & Gray, a set of quadruple-expansion engines. Messrs. D. J. Dunlop & Co., Port Glasgow, recently contracted to build two cargo lighters and a steel paddle steamer for foreign owners. Mr. W. S. Cumming, Parkhead, has received an order from the Clyde Trustees, for the building of a steam ferryboat for cross-river passenger traffic. Mr. R. McAllister, Dumbarton, is to construct a steam launch, 53 ft. long, for Messrs. J. F. Borthwick & Co., Glasgow, and Messrs. D. McGill & Co., Irvine, are to build a steam lighter, the engines, in both cases being supplied by Messrs. M. Paul & Co., Dumbarton. Messrs. Murray Brothers, Dumbarton, have received a contract to build a large steam yacht of about 160 ft. in length. The engines in this case also are to be supplied by Messrs. M. Paul & Co., engineers, Dumbarton. Messrs. Murray Brothers' yard had been closed for some considerable time back. Messrs. Denny & Co., of Dumbarton, are about to effect an extension of their engineering works, which will add greatly to the facilities of one of the most important industries in Dumbarton. Messrs. Rankin & Blackmore, engineers, Greenock, have contracted with the Clyde Shipping Co. to construct a tug steamer similar to the *Flying Cormorant*, the dimensions being 135 by 24 by 12. Messrs. McKnight, Ayr, will build the hull, and the machinery will be supplied by Messrs. Rankin & Blackmore.

The Fairfield Shipbuilding and Engineering Co., Gavan, are pushing ahead with the new channel paddle-steamer *Calais Dourer*, and the Royal Mail Steam Packet Co.'s large mail and passenger steamship. It is announced also that they have recently received the contract for a large steamship for the Atlantic trade, from what company is not stated.

Messrs. A. B. Craig & Co., of Caledonia Engine Works, Paisley, have acquired the engineering and foundry works known as the Snowdown Works, formerly carried on by the late Mr. D. S. Porteous. They cover an area of 3,784 square yards, and the purchase includes all the plant in the works and some dwelling houses adjoining. The price paid was about £6,000.

Shipbuilders at Dundee continue fairly busy. Messrs. Alexander Stephen & Sons are laying down a sailing vessel of 2,000 tons to be owned by themselves, and Messrs. W. B. Thompson & Co., Limited, have their hands full of work.

Subscriptions to the William Denny Memorial Fund have now reached the handsome total of £5,473 6s., and the general feeling in his native town of Dumbarton is in favour of the memorial taking the form of a Club or Institute, including reading and recreation rooms, and possibly a swimming bath, with all of which schemes the late Mr. Denny was known to have been in active sympathy.

Great activity in the launching of new vessels took place about the middle of the month. Between the 12th and the 19th no fewer than nine vessels, aggregating as much as 15,840 tons, were consigned to their native element. Since then there has been comparative cessation of launches, but many vessels are approaching this stage of progress.

The works of engineers, boiler-makers, and the various subsidiary industries they keep going, remain in the semi-congested state they have been in for months. Many of the engineering firms, notably Messrs. Dunsmuir & Jackson, Govan, Messrs. Hutson & Corbett, Kelvinhaugh, and Messrs. Alley & Mackellan, Polmadie, have over a dozen sets of engines on hand, and have practically to refuse other contracts. Founders and forgers have the greatest difficulty in meeting the demands made upon them, and in some cases the orders for jobs have had to be cancelled and the jobs placed elsewhere.

The success which has attended the establishment of the new shipbuilding firm of Mackie & Thomson, Govan—in so far at least as receiving vessels to build is concerned—and the extensions which firms there and here are making to their works, have seemingly encouraged others to go into similar enterprises. It is reported that the yard at Whiteinch, formerly occupied by Messrs. Wingate & Co., and which has been for many years vacant, has been purchased for a London firm who intend using it chiefly for the construction of torpedo craft. At Port Glasgow, also, the yard and engine works so long occupied by Messrs. Blackwood & Gordon, have been purchased by a new firm who will at once resume operations under the old name. The gentlemen who have purchased the business are Mr. Blackwood, sole partner of the late firm; Mr. McGeoch, who was for many years associated with him; Mr. F. P. Purvis, from Messrs. Wm. Denny & Brothers, shipbuilders, Dumbarton, and Mr. W. Carlisle Wallace, from Messrs. Denny & Co., engineers, Dumbarton. Mr. Purvis, who is a comparatively young man, has been for the last twelve years or so at the head of the scientific staff in the drawing office of Messrs. Denny, and previously assisted the late Dr. William Froude, whose powers as an original investigator in such matters as the forms and buoyancy of ships, &c., were in great request by the Admiralty authorities, and who was frequently engaged on Royal Commissions connected with the Navy. Mr. Wallace, who is also a young man, has served with Messrs. Denny & Co. for several years in the capacity of draughtsman. All the other shipbuilding yards in Port Glasgow are at present filled with work, and the resuming of labour in the large works referred to will add materially to the prosperity of the town.

It has been finally settled that the vessel to take the place of the Clyde Training Ship *Cumberland*, recently destroyed by fire, is H.M.S. *Revenge*, and not, as stated in our last month's notes, the *Pembroke*. The *Revenge* is at present the flagship at Queens-town, and will be brought to the Clyde as soon as the Lords of the Admiralty can place an iron-clad on her present station. She is a magnificent line of battle-ship of 5,260 tons, carries the flag of Rear-Admiral James E. Erskine, is full-rigged and masted, and is about 1,000 tons larger than the *Cumberland*.

## TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

The Tyne.—During the first two weeks of April the weather was exceedingly unfavourable for the progress of outdoor work, and operations in the shipbuilding establishments were, consequently, much impeded. The Easter holidays have also intervened, and though nominally only four days were devoted to the observance of the annual festival, it is greatly to be doubted that things had returned to the normal course in that period. Taking these and other causes of stoppage into account, it may be calculated that the results of the month's operations will have fallen very far short of builders' expectations. In spite of this drawback, however, the forecast which was formed at the beginning of the year with regard to the realisation of an exceptionally heavy output for the twelve months, may yet be fulfilled, if the operatives connected with the iron and steel departments can be got to attend regularly to work during the summer and autumn seasons. A well-attended meeting of Tyne ship-builders took place about the middle of the month to consider, among other matters, the possibility of more nearly assimilating the rates paid for plating-work in the different yards. At present there is a separate price list for each establishment, and the object now contemplated appears to be to establish a uniform price list—or, at all events, a very near approximation thereto—for all. Nothing of a definite nature has yet been done in the direction indicated, but as the outcome of the meeting referred to, it is probable that some change will shortly be carried out, which will have the effect of more nearly equalising the rates paid for plating-work throughout the district. A matter of difference between the carpenters and joiners, which has on several occasions caused a good deal of friction, is now in a fair way of being adjusted. The point of difference is, that each section of men have put forward an exclusive claim to deal with certain specified parts of the woodwork on vessels building, and on more than one occasion the persistence in this claim by one or other of the sections has resulted in a strike. It has now been decided to refer the matter to arbitration, and both classes of operatives have signified their willingness to accept this method of settlement. The "jobs" with reference to which the rival claims have been put forward, are only few in number, and guided by custom, the arbitrator should have little difficulty in defining the strict rights of each class, so as to avoid all possibility of disputes arising in the future. Messrs. Armstrong, Mitchell & Co. have given special attention to the building of oil-carrying steamers, and have achieved quite exceptional prominence in this particular line. During the past couple of years they have turned out some of the very finest steamers that are now engaged in the development of this important branch of commerce, and of the large amount of tonnage now filling the stocks at their Low Walker yard by far the greater proportion is intended for the same trade. At their Elswick yard the whole of the berths are occupied, with the exception of two that were specially prepared for the building of the heavier class of war vessels, and on one of which the *Victoria* was built. These berths have remained vacant since the launching of the last-named vessel, but it is confidently believed that one or both will be utilised before the close of the present year. Among the many important contracts in hand at the yard of Messrs. Hawthorn, Leslie & Co., is a large passenger steamer, to which a complete installation for the electric light has to be supplied by Messrs. J. H. Holmes & Co. The graving dock connected with the yard, which is one of the largest and most conveniently situated in the district, is constantly occupied, most of the vessels for which its accommodation is required, being of exceptional heavy tonnage. Messrs. Stephenson & Co., whose yard adjoins the establishment last referred to, have few if any contracts to proceed with besides those now in progress, which consist of three or four vessels of a rather large class. The fact of the firm being comparatively unfettered for the future, however, may prove an advantage, as there is now a possibility of taking contracts on more favourable terms than could have been obtained some months ago. The activity at Messrs. Palmer's Jarrow & Howden yards, is undiminished, and berths are only allowed to remain idle after the launching of vessels, while the *débris* is being removed to make way for the putting down of other keels. The Tyne Shipbuilding Co. launched early in the month a fine steamer named the *Cape Colony*, and they have now on the stocks four others in various stages of construction. This company, it may be stated, have a very high reputation for the quality of their work, and th

resources are somewhat limited, the very most is made of them by intelligent and careful management. Messrs. W. Richardson & Co. have contracted largely for the supply of tonnage to foreign countries this year, and most of the vessels now on the stocks, as well as others that have been launched, are intended for special trades in various parts of the world. Both the yards at Wallsend (Messrs. Schlesinger, Davis & Co.'s, and Messrs. C. S. Swan & Hunter's) are extremely busy, and both have during the present year added largely to their productive capacity. Messrs. W. Dobson & Co., who, by turning out such a vessel as the *Port Caroline* (built for Messrs. W. Milburn & Co.) have demonstrated their ability to execute the highest class of work, are well supplied with orders, and it is understood that among them are one or two commissions for the building of vessels of a very special class. Messrs. Wood & Skinner have four vessels on the stocks, and have also a repair contract to proceed with. Messrs. Readhead & Co., Tyne Dock; Messrs. Smith & Co., North Shields; Messrs. Edwards, Howden; and Messrs. Eltringham, South Shields, are all plentifully supplied with orders, and in repairing establishments at the centres named, business is generally very active. Mr. Wasteneys Smith is still exceedingly busy with his patent "stockless" anchors, and has received a number of important orders during the month, including all the anchors for the China Shippers' new vessels.

**Engineering.**—In the marine engineering establishments the greatest possible activity continues to exist, and in every instance steps have been taken to increase the productive capacity by the putting down of additional plant. Messrs. Palmer & Co. have just completed the engining of a vessel named the *Redruth*, built to the order of a Cardiff firm, and are now engaged in supplying the engines to a much larger vessel, named the *Emir*, which has been built for Liverpool owners. Among the special contracts in course of execution by Messrs. Hawthorn, Leslie & Co. is the engining of a "dispatch boat" for the Japanese Government, which has been built in the Imperial Dockyard at Yokosuka, Japan. The Wallsend Slipway and Engineering Co. have completed an unusually large number of contracts during the present year, and have now more than a dozen sets of engines in progress. The North-Eastern Engineering Co. have, in the matter of output, exceeded the record for the first four months of any former year, since the opening of their Wallsend establishment. Messrs. Black, Hawthorn & Co., are engaged in engining the s.s. *Hazelmere*, built by Messrs. R. Thompson & Sons, Sunderland, for Messrs. Jaques & Co., Newcastle. Messrs. R. Stephenson & Co. are also engaged in engining a vessel at the Shearlegs connected with their Hebburn yard. The steam winch and windlass manufactory of Messrs. Clark, Chapman, Parsons & Co. is kept extraordinarily busy, and the weekly output fully equals the best records of former years. The electric lighting department is also showing great briskness, among the most important contracts in hand being a complete installation for the British India Steam Navigation Co.'s steamer *Mombassa*, recently launched by Mr. James Laing. Messrs. Watson & Sons, of the High Bridge Works, Newcastle, have a great quantity of work in progress, and the maintenance of exceptional briskness for many months to come is placed beyond a doubt by the fact that new orders for boiler feed and water ballast pumps, ships' side lights, &c., are continually being received. Messrs. Mail & Co., engineers &c., Tyne Dock, have executed a great number of contracts for repairs to steamships during the present year, and have now a large amount of work in hand. The works are most conveniently situated, and are in every way admirably adapted for the quick and economical execution of steamers' repairs. Messrs. John Spencer & Sons' works at Newburn are still showing extraordinary activity in all departments, and their extensive forge works at Ouseburn are kept going to their full capacity. The other forge works in the district are fully employed, but special mention may be made of Messrs. Hawthorn, Leslie & Co.'s forge at Hebburn, where some exceptionally heavy stern frames and shaft sections for marine engines are now in course of manufacture. The finished iron works at Gateshead, Winton and Jarrow, are now being kept in regular operation, and steel works at the last-named centre are very busy. The chain works at Gateshead show a greatly improved state of business, and rivet works there and at Blaydon are busier than they have been at any time for some years past.

**The Wear.**—The same causes which tended to retard ship-building operations on the Tyne this month have had an equally restrictive effect in the other North-Eastern centres, in-

cluding, of course, the port of Sunderland. No very marked progress has consequently been made with the contracts in hand, but as a good many vessels were in advanced stages at the beginning of the month, builders have been enabled to put a fair number into the water. The most important launch to be recorded for the month was that of the *Mombassa*, which took place on the 17th. The vessel was, as stated elsewhere, built by Mr. James Laing, for the British India Steam Navigation Co., and is among the very largest that have yet been built on the North-East coast. The construction of the vessel was only commenced in September, and it is therefore quite evident that no time has been lost in carrying on the work to the advanced stage which admitted of removal from the stocks. Sunderland builders, however, are noted for despatch in execution, and the building of the large Spanish steamer, *Wifreda*, at the North Sands yard, last year, was quite as remarkable an instance of rapid work as the one above referred to. The keel for another passenger steamer of even larger dimensions than the *Mombassa*, is now being laid by Mr. Laing in the berth rendered vacant by the launch of the latter. Works of extension have been going on in connection with this builder's premises for some time past, the latest addition being a fitters' shop, which has just been completed, and a plumbers' shop, which is still in course of erection. It should also be stated that a large set of bending rolls and three Cameron's punching and shearing machines have recently been added to the plant. The latter have been supplied through Messrs. E. Beckwith & Co., the agents of Messrs. Cameron for the North-East coast. The Sunderland Shipbuilding Co. have six large steamers to build for a foreign shipowning company, besides a considerable amount of other work for owners in this country. Messrs. J. L. Thompson & Sons are launching vessels in very rapid succession this year, and according to present indications, they are pretty sure to exceed in this year's output all their past high records. The last vessel put off the stocks was the *White Jacket*, which was built to the order of a Cardiff firm. Messrs. Short Brothers and Messrs. Doxford have each an abundance of work, and at Messrs. R. Thompson & Son's yard, Southwick all the available berths are occupied. The last-named firm have completed several important repair contracts during the past three or four weeks. Messrs. Pickersgill are preparing to launch an iron sailing ship, and have another to lay down. These are the only sailing ships now being built on the river. The whole of the other yards are kept actively going.

**Engine Works.**—At the Palmer's Hill Works the engines and boilers are now being supplied to the s.s. *White Jacket*, recently launched from the yard of Messrs. J. L. Thompson & Sons. This is the fourth boat from the same builders that has been engined at the Palmer's Hill Works this year. Messrs. Clark are engaged in supplying the engines, &c., to the s.s. *Mombassa*, and they have some other heavy sets of engines in course of construction in the shops. At the other marine engine works a very exceptional state of briskness is still to be noted. Mr. John Wigham, of the South Hylton Engine Works, has, since the opening of the year, made some important additions to the plant of his establishment and it is probable that at an early date an extension of the premises will be entered upon. The manufacture of a new speciality known as Donovan & Wigham's Patent Disc Stop and Reversing Valves, has recently been commenced at these works, and a steadily growing demand for the same is being experienced. These valves are applicable to steam winches, ash hoists, turning and reversing engines, &c., and as the advantages possessed by them are both numerous and important (among them being that of entirely dispensing with link gear), they can scarcely fail to come into very extensive use. Mr. Wigham has now in hand a large number of steam winches, both of the compound and ordinary types, ash hoist engines, turning engines, donkey pumps, &c., and he makes a special feature of marine engines up to about 70 H.P. The slipway attached to the works has recently been lengthened, and is now capable of accommodating vessels of much larger dimensions than hitherto. Boiler and tank works are kept very busy, and the proprietors of iron foundries are finding it exceedingly difficult to meet the requirements of customers. The large new shop that has been for some time in course of erection at Messrs. J. L. Thompson & Sons' Paillion Forge Works, is now about ready for occupation, and as it has been fitted up with a complete equipment of suitable plant, its opening must add enormously to the general productive power of the establishment. The other forges in the district are quite full of work. The demands upon the resources

of finished iron works continues to be very heavy, and both chain works and rivet works are kept in active operation.

**The Hartlepool.**—The activity in the shipbuilding industry at this centre continues to be fully maintained, and in addition to the large amount of new work on the stocks, several repair contracts are being dealt with. Marine engineering establishments are also showing a continuance of the briskness noted in previous reports. Messrs. T. Richardson & Sons have during the month placed on board and completed the machinery for the following vessels:—The *Ethiopia*, for Messrs. Elder, Dempster & Co., Liverpool, having triple-expansion engines 24 in., 38 in. and 64 in., by 3 ft. 6 in. stroke, and two large double-ended boilers; the *Exchange*, for James Westoll, Esq., Sunderland, having triple-expansion engines 21 in., 35 in. and 54 in., by 3 ft. stroke, and one large double-ended boiler; the *Rhio*, for the Pinkney Steamshipping Co., Limited, having triple-expansion engines 22 in., 37 in. and 61 in., by 3 ft. 6 in. stroke, with two large single-ended boilers. The *Mountain*, for Messrs. Christie & Co., Cardiff, with triple-expansions 21 in., 35 in. and 58 in., by 3 ft. stroke. The following vessels, fitted with Messrs. Richardson's engines, have had successful trial trips during the past month, and have proceeded to sea:—The *Hudson*, of the Hudson Shipping Co., Limited, on the 30th March; the *Wastwater*, owned by Messrs. Huddart, Parker & Co., Melbourne, on the 9th April; the *Magnus Mail*, owned by James Westoll, Esq., on the 17th April.

The following trial trips of vessels engined at the Central Marine Engineering Works of Messrs. W. Gray & Co., have recently taken place, the results in each case being highly satisfactory:—

On March 19th the s.s. *Clio*, owned by Messrs. Wilson, Sons & Co., of Hull, under the superintendence of Mr. Spear.

On March 30th the s.s. *Falka*, launched on March 5th (see page 33 April number), sailed for Bombay with a full cargo of railway iron. Mr. J. R. Fothergill, with whose system of forced draught the boiler has been fitted, was on board.

On April 13th the s.s. *Ariel*, launched on March 16th (see page 33 April number), sailed for Cardiff, and though light, with propeller only partly immersed, made a splendid run to that port, averaging 10½ knots, and doing the distance in 69 hours. The vessel has since sailed for Singapore.

On April 20th the s.s. *Thurston* had a loaded trial trip (the cargo consisting of 2,720 tons coal and coke) with a large party of friends on board. The vessel has extra boiler power, and she showed it to great advantage, making 75 revolutions during a three hours' full speed run along the coast, everything in the engine-room remaining cool. The vessel travelled well and a speed of close upon 11 knots was attained, the average being fully 10½ knots. The vessel, which is owned by Messrs. Murrell & Yeoman, of West Hartlepool, sailed on the above date for Genoa.

Messrs. W. Gray & Co. have recently launched the s.s. *Norlands*, for Messrs. Hardy, Wilson & Co., of West Hartlepool, and the *Isleworth* for Messrs. Watts, Ward & Co., London. The steamer *Montana*, which was sunk by the North German Lloyd's steamer *Main* on the Delaware river, is now in the hands of the firm for repairs; extensive removals of the damaged portions are being made at the dockyard, and the machinery is being overhauled at the engine works (the Central Marine). The first of the new steam hammers, in the extensive new forge which is being added to the engineering department, and to which reference was made in last month's Trade Notes, has now been started, and work is gradually taken up as the new buildings approach completion.

The steel works continue to be kept in very active operation, and the other local industries are in a fairly prosperous condition.

**Stockton.**—The building berths in the Stockton shipyards continue to be fully occupied, most of the vessels on the stocks being of large tonnage. The engineering works are quite as busy as similar establishments at other centres, and manufacturers of gas-making plant are well supplied with orders. Iron and steel works are exceedingly active, a state of matters which is not surprising when it is considered how large a proportion of the material used in shipbuilding and boiler construction, not only on the North-East Coast, but in the country generally, is supplied from this great seat of production. Steam winch manufactories here, as elsewhere, are very busy, and forges are showing very exceptional activity.

**Middlesbro.**—Messrs. Harkess & Sons, who for a great number of years have been engaged in ship repairing at this centre, but who hitherto have not entered very largely into the building of

new vessels, have recently made extensive changes in their establishment, with the view of more fully developing their business in the last-named branch of the trade. Besides laying out new building berths, they have put down additional plant of a most effective kind, and have taken all necessary measures for ensuring success in their new departure. They have engaged as manager Mr. Grant Barclay, who recently occupied a position of equal responsibility under the Sunderland Shipbuilding Co. Messrs. Harkess have been fortunate in securing the services of this gentleman, as he has both energy and experience, and may be trusted to make the most of the facilities provided for carrying on work in both the constructive and the repairing departments. It may be stated that the firm have some good orders to proceed with, and their business connection being already extensive, their prospects of securing a fair share of work in the future are excellent. The other shipyards continue in full activity, and engineering works are much busier than they were at the opening of the year.

**Darlington.**—Among the contracts now in hand at the Darlington Forge Co.'s Works may be mentioned stern frames, &c., for Messrs. Raylton, Dixon & Co., Messrs. Ropner & Son, Mr. James Laing, Messrs. Wigham, Richardson & Co., Messrs. D. & W. Henderson, Glasgow, Messrs. A. & W. Dudgeon, Antwerp, and Messrs. Retherstie & Co., Hamburg. They have also orders for heavy engine shafting from the North Eastern Marine Engineering Co., and other firms engaged in engine construction. In other departments of the works they are busily engaged on "mill and pinion housings" for the plate and bar rolling mills of Messrs. Palmer & Co., Jarrow, and on certain sectional parts of a new railway bridge at Selby. In addition to the foregoing, the company have work in hand for Messrs. Armstrong, Mitchell & Co., and many other firms of the highest standing. The company are now putting down a new lathe which weighs 120 tons, and will be capable of dealing with any piece of work that does not exceed 9 ft. in diameter. It is no exaggeration to state, that this lathe will be one of the most powerful machines of the kind to be met with anywhere. The Darlington Waggon and Engineering Co. have participated to a very large extent in the general trade improvement, and are now very busy in all departments. Among the orders at present in hand may be mentioned one for 300 waggons from the Great Northern Railway Co., and another for 100 iron coal waggons, which are to be forwarded in sections to New South Wales. They have also a good deal of work in progress for Messrs. Armstrong, Mitchell & Co., Messrs. Bolckow, Vaughan & Co., and others. The bridge building department is well employed, most of the work in hand being intended for despatch to foreign countries. A wages sliding scale, to continue in existence for two years, has been arranged between the employers and operatives connected with the Board of Conciliation for the Northern Manufactured Iron Trade. The scale is said to be more favourable to the operatives than any former arrangement of the kind, and it appears to have been accepted without dissent.

## THE MERSEY.

ONE of the earliest things to chronicle this month is the very satisfactory report of the directors of the Cunard Steamship Co., which was presented to the shareholders on March 27th. After bringing forward £1,143 from 1887, the gross profits amounted to £314,736; and after paying income tax and providing £135,326 for depreciation of ships and wharf property, and £46,814 for ordinary insurance, there is left to the credit of the profit and loss account £130,171. It is proposed to credit £23,000 to the reserve fund, and to absorb £40,472 in the insurance fund, the proposed dividend of 4 per cent. accounting for £64,000 of the remainder. These very favourable results have been brought about in spite of the considerable falling-off in the number of cabin passengers in 1888, and have been greatly aided by the large increase in the number of emigrants, and an increase in freights during the latter portion of the year. The Mersey Railway Co. also show a very favourable return, their receipts for the last half-year having exceeded those of the corresponding time last year by 25 per cent., the total number of passengers carried during the two periods named being (exclusive of season tickets in each case) 3,786,480, and 2,492,700.

The Liverpool Electric Supply Co. are making great progress both on land and sea, so to speak, as not only have they recently secured the contract for lighting the two new White Star liners

now being built in Belfast, but many of the large hotels and the principal clubs in the town are now supplied direct by them.

Rumour hath it that some of the subsidised Germans are arranging for the carrying of passengers from Queenstown to New York, and that the German Lloyd's Co. have entered into a contract with the Argentine Republic for carrying European emigrants to Buenos Ayres, and among other places from Ireland.

In the early part of the month there was a slight falling off in the live stock and dead meat imports, though the quarterly returns of imports from American and Canadian ports show a total increase for the past three months of 408 cattle, 3,044 quarters of beef, the totals for the three months being respectively 19,964 and 129,154. Mr. Walter Laing read a very interesting paper before the Liverpool Engineering Society on April 3rd, entitled, "Remarks on Steamship Performance Diagrams." Those of our readers who can procure a copy of the paper would find it well worth their while to do so.

In the timber trade prices all round continue firm, and as things are, the outlook is decidedly good. There is no stock of lignum vitæ, which is in great request, and, consequently, for this particular wood prices are high. The Works Committee of the Mersey Docks and Harbour Board have submitted a recommendation to establish a new hydraulic power centre, with the necessary buildings, engines, pumps, &c., to be erected at the north-east corner of the new Toxteth Dock, for working a large number of cranes, jiggers, dock gates, swing bridges, etc., belonging to the dock extension at the south end. The contract of Messrs. Armstrong, Mitchell & Co. has been accepted for the pumping machinery. Nearly 20,000 emigrants have left Liverpool during the last three weeks, and this, considering the season has only just commenced, looks as if the steamship companies were going to have their hands pretty full with this class of traffic for some time to come, in fact they already find great difficulty in meeting the unexpected demand on their accommodating powers.

At a general meeting of the shareholders of the Leeds and Liverpool Canal Co. the directors' report showed a net revenue of £51,992 as compared with £47,857 in 1887. A further dividend of £9 per share—making a total of £17 for the year—was proposed to be paid.

### WELSH NOTES.

SINCE our last issue there has been registered at Somerset House, the Barry Graving Dock Engineering Co., with a capital of £110,000 in £10 shares. As its name indicates, the company owns a dry dock at the new freighters' dock at Barry. The new dry dock will be most complete and capable of taking in four large steamers at a time. The first directors are men of well-known ability, and they have engaged as their manager Mr. John Lowden, who was for some years in charge of the Wallsend Co.'s works at Cardiff. That the new company will prove a financial success there can be little doubt, for it will possess no competitor.

The promoters of the much-talked-of tinplate met with but a cool reception when they visited Swansea a few weeks since to interview the chief manufacturers of the district. The majority of the workers simply declined to have anything whatever to do with the scheme, either one way or the other, whilst those who did speak declined to even entertain any proposal whatever, so Messrs. Fowler & Co. had to return to London lamenting. They have not yet lost all hope, but they have very small ground, if any, for being sanguine.

We understand that a new tinplate works is to be erected at Kidwelly by a company which is to be known as the Gwalia. A most admirable site has been secured, and new shareholders are required. No doubt the concern should prove a success.

The Board of Trade returns for the three months ending March gave some very interesting particulars as to the growth of the tinplate trade during the last three years. For the last quarter 1889, the exports amounted to 110,017 tons; for the corresponding period in 1888 the exports were 87,591, and for 1887 they were 77,559. This enormous increase, over 25 per cent. for the three years, appears to show that even the increased output of old works and the output of the new works will not materially effect prices, the demand increasing at such a rate. When we come to examine the figures more minutely it is found that the increase is due to the United States consumption, and to the in-

creased demand from Russia. In all other directions there has been a decrease.

A most interesting exhibit is being sent to the Paris Exhibition by the Abercane Coal Co. It takes the shape of six blocks of coal, the largest of which measures 7 ft. 6 in. high, 5 ft. 6 in. wide, and 3 ft. 6 in. deep. Its weight is 5 tons 10 cwt. The piece was cut from the 9-ft. black vein seam.

There is an improvement in the trade prospects of Llanelly. At present the output, amounting to 500 tons per day of the Great Mountain Anthracite Colliery, is shipped at Swansea, but the proprietors of the colliery being Llanelly men, wish to give the benefit of their shipments to their own port, and with this intention have persuaded the Llanelly Harbour Commissioners to undertake certain dredging operations. In a short time the output of the colliery will reach 1,000 tons per day, and the shipment of this at Llanelly will mean a very considerable increase in the revenue of the port.

It is stated that the directors of the Barry Dock and Railways Co. have received many applications for land on which to build offices at the new docks. This appears to show that the Cardiff men also have made up their minds to support the new dock, and mean to be near the scene of operations. The new dock is to be opened about June 18th, and judging from the crowded state of the Bute Docks, both shipowners and coal shippers will hail that opening with delight.

The South Wales Smelting Co., Limited, is a concern which has had but a short life. It was established in 1884 by Poignolstre & Mesnie, of Swansea, for the erection of works at which to carry out a system of extracting copper from the huge quantities of copper slag lying waste at Landore. Somehow or another this did not prove so successful as was anticipated, and the smelting of ore was gone in for. This appears to have been equally unsuccessful, for the concern is being wound up by an order of Court made a week or two since.

Cardiff men have been very much *en évidence* at Westminster during the past month in connection with several South Wales Bills. One was for the construction of a new line of railway from Bridgend to Barry, going through a district hitherto entirely without means of railway communication whatever.

Another important Bill was presented by the Barry Dock Co., who sought special pilotage advantages for their new dock. The Cardiff dock and pilotage authorities, as did the pilotage authorities of other British Channel ports, thought that Barry should have no special advantages; that the existing pilotage boards were quite sufficient, and that none were needed for Barry. The Parliamentary Committee, however, decided otherwise, and the preamble of the Bill was passed, with the condition as regards Channel pilots that the Barry Pilotage Board shall, for three years, grant their licenses only to men already licensed by the other ports.

The Cardiff coal shipments for March show an increase of nearly 100,000 tons as compared with the corresponding month of last year, the figures being 806,430 against 709,934. The coal shipments of the other South Wales ports do not show a proportionate advance. Newport shipped 204,670 against 221,875—a very decided decrease; Swansea also came out worse than 1888, shipping 81,039 against 81,321 tons. The total coal shipments of Cardiff for the three months to March were 2,284,707 tons, from which it appears that the increase of 1888 over 1887 will be paralleled as 1889 and 1888. Newport, on the other hand, appears to be going in the bare direction of shipping less this year than she did in 1888, which, as our readers will remember, was less than in 1887.

It will be remembered that when we last referred to Bute Taff Amalgamation there had been no statement made as to the proportion of the net receipts to be taken by each party to the agreement. Since then, however, a statement has been made to the effect that the Railway Co. is to take 71, the Docks Co. 29, per cent.

At the recent Birmingham quarterly meeting, a very firm attitude was taken by the tinplate makers, who allege that the demands made by merchants are unreasonable. The latter merely want to buy at less than cost price, a by no means uncommon feature with buyers. The makers reported that they were full of orders, and that the majority of the mills were working night and day. Those who are idle are so simply because they are old-fashioned, and cannot compete with more modern works.

Some attention is being paid to the fish trade of Milford Haven. It must be rather a down-come for the Milford Dock Co. to find that after all their expense and all their brave words, that it is only trawlers who honour them with any patronage; but no doubt they are thankful for small mercies. We append some figures relative to this particular trade (fish), which show that

Milford occupies the premier position herein, if in nothing else.

Port.	Quantity (excluding Shell Fish).	Value (excluding Shell Fish).	Total Value (including Shell Fish).
	Cwts.	£.	£.
Cardiff .. ..	12,248	8,495	8,495
Swansea .. ..	5,926	6,570	6,570
Mumbles .. ..	382	446	1,603
Llanelli .. ..	624	564	564
Penby .. ..	10,863	9,173	9,188
Neyland (Milford) ..	157,419	150,573	150,573

The above figures are for 1888 only; possibly before 1889 ends the new docks at Milford will have become as accustomed to American liners as they now appear to be to fishing smacks.

Considerable attention is being paid just now to the Welsh Railways Union Bill. It is about time something were done to raise these concerns from the slough of despond which they at present occupy, but there can be little hope of that until some very stringent measures are adopted. They have together a capital of about £15,000,000, and no dividend has ever been paid upon more than half of this. There are in fact only two or three railways in Wales—and these are kept going by the coal trade only—which have ever done any good. Whether this unfortunate state of affairs will ever be remedied remains to be seen. At present the Welsh lines, apart from the Taff Vale, Rhimney, &c., which have a large local mineral traffic, are entirely at the mercy of the railway trunk lines, such as the Great Western Railway, London and North Western, &c.

The South Wales coal people are jubilant on account of the reply made by the Admiralty to the Lanarkshire Coal-masters' Association. The former state that repeated trials have proved the Scotch coal to be very inferior to Welsh, and the ships of the Royal Navy will not, therefore, use the Scotch coal. If the Navy requires coals free from smoke, they must buy Welsh coal, as everybody who knows the coal trade can assert from experience. The North-country coal-owners are trying to introduce their coal, but their experience will be the same as that of the Scotchmen. The North-country coals simply cannot touch the Welsh coals, and any attempt to prove anything to the contrary can produce nothing but an evidence of good time wasted.

A new industry has been started at Cardiff, and it is in connection with the tinplate trade. The casual observer might very naturally ask why such a trade was not established at Swansea, the headquarters of the tinplate trade, but people who know South Wales are only too well aware of the fact that Swansea always occupies a back seat until some facts operating from outside compel her to come to the front. The lack of energy shown by everybody connected with Swansea now-a-days is something deplorable. As a matter of fact the few energetic men possessed by Swansea are chiefly in connection with the ship-repairing industry, and their endeavours to bring Swansea's great advantages to the front, are laughed at by old Swansea men. The latter never had any need to push, and they cannot understand anybody departing from the old-fashioned rule.

Coal prices show a tendency to weaken. Buyers have apparently satisfied their demands for a considerable period on account of the great signs of a strike, which were recently apparent, and, as a consequence, prices are drooping. Possibly they were put up too much in the first instance.

Freights continue fairly steady, and will continue so for some time yet.

On the whole the South Wales men have no need to quarrel with present trade appearances.

## BELFAST TRADE NOTES.

It is a pleasure to be able to record that business in the north of Ireland is now in a most flourishing condition all round. The small strikes which occurred during the past month were happily speedily settled, and employers and employed are now working together satisfactorily.

Boiler-makers continue to be very busily occupied on the construction of land boilers, and several good orders have been recently booked, with every promise of more to follow.

All the shipbuilding yards are very full of work, and are also, most of them, in the enviable position of holding sufficient

orders to keep them going for months to come. A very satisfactory trial of a Belfast-built boat took place in the early part of April, the s.s. *Star of England*, built by Messrs. Workman, Clark & Co., of this port, making 11 knots per hour with 5,700 tons deadweight on board, the engines, which indicated 3,000 H.P., being by Messrs. John & James Thomson, of Glasgow.

Among other signs of a revival of trade, it may be noted that the distilleries and tobacco factories are steadily increasing their output, as is evidenced by the very large customs' returns.

The Town Council of Belfast are going in for paving the footpaths of new streets with tiles made by the Ferrumite Patent Pavement Co. This form of pavement has proved itself to wear well, and we are pleased to see a local enterprise meeting with the encouragement which it deserves. A Liverpool electrical company have carried off the contract for lighting the two new White Star Liners now building here.

The general activity has had its effect on the linen trade, and finished linens, cambrics, &c., are as a consequence in good demand at full rates.

## LEITH NOTES.

THE trade has been unusually heavy during the past month, and firms are having the greatest difficulty in executing all the demands made on them by shipowners for repairs, &c. Only one launch has occurred, namely, the launch of the s.s. *Rosary*, a fine steel screw steamer, built to the order of Messrs. Harris & Dixon, 81, Gracechurch Street, London. She is 230 ft. long by 32 ft. by 16.4 ft. depth, moulded, and Messrs. Ramage & Ferguson are the builders. The latter firm have four vessels in course of construction, while Messrs. Morton & Co. have two, and Messrs. Hawthorn & Co., two. Messrs. J. Cran & Co., Albert Engine Works, are engaged in extensive repairs on the *North Star*, one of Messrs. James Currie & Co.'s fleet, while Messrs. Hawthorn's are still engaged on the Russian steamer *Hurricane*, and the Leith steamer *Dale*.

The new line of traders between Leith and Baltimore have commenced running, and two large general cargoes have arrived this month. Messrs. Hugh Clark & Co. are the agents here.

THE FRENCH TORPEDO FLOTILLA.—A new torpedo boat has been added to the French navy to replace one lost some time back in Chinese waters. This boat, which has been constructed by M. Normand, of Havre, is 118 ft. in length, and carries special machinery for discharging her torpedoes in any direction. Three other boats of similar displacement and arrangement will shortly be completed by the same shipbuilders. A torpedo cruiser, the *Vautour*, will be launched at Toulon on the 27th inst., and the two torpedo-catchers building at L'Orient are to be christened the *Léger Lévrier*.

THE GERMAN NAVAL MANOEUVRES.—It has been arranged that a manœuvring fleet, a squadron for evolutions, and a flotilla of torpedo boats shall assemble this year in the western basin of the Baltic, in the Bay of Dantzic, and in the North Sea. The manœuvring fleet, which will be commanded by Rear-Admiral von Kall, will consist of the ironclads *Baden*, *Bayern*, and *Oldenburg*, and of the corvette *Ireno* (commanded by Prince Henry of Prussia), as well as of the despatch boat *Wacht*. This fleet will assemble on the first of May and remain on service until the 1st of October. The squadron for evolutions will be commanded by Rear-Admiral Hollmann, who now has command of the squadron stationed at Port Said, and it will consist of the ironclads *Kaiser*, *Deutschland*, *Friedrich der Grosse*, and *Preussen*, as well as of the despatch boat *Zieten*. This squadron will assemble in the early part of May, and after the manœuvres it will proceed to the northern part of the Atlantic, and thence to the Mediterranean. The flotilla of torpedo boats, under the command of Captain Barandon, will consist of the despatch boat *Blitz*, of two divisional sloops, and of 12 torpedo boats. This flotilla will commence its operations on the 24th inst. A flotilla of ironclad gunboats will also be formed, under the command of Captain von Schuckmann, meeting on the 13th of August and manœuvring for a month.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES.—ENGLISH.

**Regulus.**—Messrs. Osbourne, Graham & Co., of Hylton, completed last month the *Argo* (s.), 1,102 tons register launched on March 2nd, see page 32, which they built to the order of The Finska Angfartygs Actiebolaget, of Helsingfors, and on Saturday, April 13th, they launched another vessel identical in all respects for the same company. As the vessel left the ways she was named the *Regulus* by Madame Krogius, wife of the managing director of the company. The vessel proceeded to the South Dock, Sunderland, to receive the engines, which the North-Eastern Marine Engineering Co., Limited, have ready for her.

**Constance.**—On March 21st Messrs. James Harland & Co. launched from their building-yard at Tranmere a steam barge of the following dimensions:—Length, 85 ft.; beam, 22 ft. 2 in.; and depth 9 ft. 4 in. The vessel is built of wood, especially strong for taking the ground, and will carry well on a moderate draught. She has been purchased by Captain Joseph Monks, of Warrington, and is intended to trade between Liverpool and Warrington. The machinery will be fitted by Messrs. Cochran & Co., Birkenhead. On leaving the ways the vessel was named the *Constance* by Mrs. Monks, the wife of the owner.

**Crown.**—On March 29th a valuable addition was made to Messrs. Dent & Co.'s Newcastle and Blyth fleet of steamers, when the Blyth Shipbuilding Co., Limited, of Blyth, launched from their works a fine specimen of a modern cargo steamer for the above-named firm. The leading dimensions of the vessel, which is built to Lloyd's highest class, are as follows:—Length, 260 ft.; breadth, 36 ft. 6 in.; depth, 19 ft. 4 in. The vessel has been constructed of steel, with cellular bottom for water ballast, web frames, &c., and her deck arrangements consist of a long-raised quarter-deck, with short poop aft where accommodation is provided for captain and officers, &c., a long bridge extending from after end of engine-room to the fore side of foremast, and the crew are comfortably berthed in the fore part and the engineers in the after part of this bridge. There is also the usual fore-castle. The vessel has been built to comply with the Board of Trade requirements for carrying grain in bulk. There are four large cargo hatches, each having a powerful steam winch fitted by Messrs. J. Smith & Sons, Newcastle-on-Tyne, for working the cargo. An Emerson, Walker's patent windlass for working the stockless anchors, a Donkin & Nichol's steam steering gear is placed amidships, and a powerful screw gear aft. The engines are triple-expansion, and will be supplied by the North-Eastern Engineering Co., Wallsend, with cylinders 20 in., 33 in., and 53 in. by 36 in. stroke and 160 lb. pressure. As the vessel left the ways she was gracefully named the *Crown* by Miss Nesbit, of Newcastle. The *Crown* has been built under the inspection of Captain Patterson, the owners' surveyor, and the machinery under Mr. J. Baxter, consulting engineer, of Newcastle. This is the third vessel of similar dimensions launched by the Blyth Shipbuilding Co. this year, and they have several vessels on hand in various stages of construction.

**Sierra Fantana.**—On March 30th a very successful launch took place at the yard of Messrs. Royden & Co. of an iron ship for the firm of Messrs. Anderson & Co. A large crowd assembled to witness the event, and the ceremony of christening was performed by Miss Nancy Anderson, a child of very tender years. The vessel's name is *Sierra Fantana*.

**Trevorian.**—On March 30th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a steel screw steamer of the following dimensions:—290 ft. by 39 ft. by 20 ft.; classed 100 A 1 Lloyd's special survey. The vessel is of the improved well-deck type, and is fitted with all the appliances for grain cargoes and general trades. She will be fitted with triple-expansion engines, having cylinders 23 in., 37½ in., 61½ in., and 39 in. stroke, and supplied with steam from two large steel boilers at a working pressure of 160 lb. per square inch. The vessel has been built to the order of Messrs. Edward Hain & Son, St. Ives, Cornwall, and was named the *Trevorian*.

**Sheldrake.**—On March 30th there was successfully launched at the Royal Dockyard, Chatham, H.M.S. *Sheldrake*, a twin-screw steel torpedo ship. The vessel is the first of an improved type, specially designed as swift scouts, and her bows are pro-

tected with heavy steel plates for the purpose of repelling torpedo attacks, whilst the after portion gives a clear deck for action. She was commenced on July 4th, 1888, and her dimensions are:—Length between perpendiculars, 230 ft.; extreme breadth, 27 ft.; draught of water forward, 8 ft.; aft, 8 ft. 6 in.; displacement, 735 tons; horse power of engines, with forced draught, 4,500; without forced draught, 2,500. Armament:—Two 4.7 quick-firing guns, and four 3-pounder quick-firing guns. The *Sheldrake*, it is estimated, will be able to steam at the maximum speed of 21 knots per hour.

**Isle of Iona.**—On Saturday, March 30th, Messrs. Thomas & William Smith launched from their shipbuilding yard at North Shields an iron screw steamer of the following dimensions:—Length, 225 ft.; breadth, 33 ft.; depth, 16 ft. Her engines will be of the triple-expansion type, with cylinders 16½ in., 27 in., and 44 in. by 33 in. stroke. The vessel has a deadweight capacity of about 1,650 tons, is built to the highest class at Lloyd's, and is adapted for the general carrying trade, being fitted with every facility for quick loading and discharging of cargoes. The vessel was named the *Isle of Iona*.

**Cape Colonna.**—On March 30th there was launched from the yard of the Tyne Iron Shipbuilding Co., a steel screw steamer, built to the order of Messrs. William Milburn & Co., of Newcastle and London. She is of the well-deck type, and of the following dimensions:—Length, 312 ft.; breadth, 40 ft. 6 in.; depth, 24 ft. 6 in. She will carry upwards of 4,000 tons deadweight, and will be engaged with powerful triple-expansion engines. She is fitted with all modern improvements for the rapid loading and discharging of cargo. The vessel was named the *Cape Colonna*.

**Rossmore.**—On April 1st there was launched from the yard of Messrs. Royden, in Liverpool, a magnificent steel screw steamer for the well-known firm of Wm. Johnston & Co., of Liverpool and London, for their Baltimore trade. On leaving the ways the vessel was named the *Rossmore*. She is of the following dimensions:—413 ft. long, 46 ft. beam, and 29 ft. depth of hold. Her gross tonnage is 4,500, and she has a carrying capacity of 6,500 tons. The *Rossmore* will be fitted to carry 1,000 head of cattle, in addition to her cargo, and has a double bottom for 950 tons water ballast. She is fitted with all modern improvements, and will be propelled by the most improved type of triple-expansion engines of 450 H.P. nominal.

**Euphrosyne.**—On April 2nd, a fine screw steam yacht named the *Euphrosyne*, was launched at Gosport from the slipway of Messrs. Camber & Nicholson. The vessel was designed by Mr. Nicholson, and built for Mr. Pawson, of Alnwick. The dimensions of the vessel are well arranged. She is 146 ft. long, and between the perpendiculars 130 ft., whilst her extreme beam measurement is 19 ft. 6 in. Her draught of water is 8 ft. 6 in., and her tonnage is registered as 220. She is oak-framed, with pitch planks, and is fitted with "Clark-Chapman's" patent horizontal steam windlass, and other modern improvements have been introduced into her general fittings. The *Euphrosyne* has been constructed so as to give the best possible accommodation; and the cabins, &c., are of polished pine throughout. The vessel was christened by Miss Bulkeley, daughter of Major Bulkeley, of Southsea. The yacht will at once be sent to Dundee, where she is to be fitted with triple-expansion engines by the firm of Thompson. Messrs. Laphorn and Ratsey, of Gosport, fitted the sails.

**Ringmoor.**—On April 2nd there was launched from the shipbuilding yard of Messrs. Schlesinger, Davis & Co., Wallsend, a handsomely-modelled iron screw steamer, built to the order of the Ipswich Steam Shipping Co., Ipswich. Her principal dimensions are as follows:—Length, between perpendiculars, 142 ft.; breadth, moulded, 21 ft.; depth, moulded, 10 ft. 8 in. The vessel has been built to the highest class at Lloyd's, and specially arranged for the conveyance of machinery. Accommodation for the captain, officers, and a few passengers has been provided under the raised quarter-deck aft, the fore-castle being fitted up in a neat and substantial manner for the crew. The vessel will be rigged as a fore-and-aft schooner, and will be fitted by Messrs. Ernest Scott & Co., Close Works, Newcastle, with triple-expansion engines and steel boiler of sufficient power to drive her at a speed of 10 knots when loaded. The vessel was named the *Ringmoor* by Miss Wilson, daughter of Dr. Wilson, Wallsend.

**Italia.**—On April 2nd there was launched from the Low Walker shipbuilding yard of Sir W. G. Armstrong, Mitchell &

Co., a large and powerful steamer of 5,500 tons burthen, which is owned by the Hamburg-American Packet Co., Hamburg, and is intended for their emigrant trade between Hamburg and New York. The vessel is built of steel to the highest class at Lloyd's and Veritas, and has full poop, long bridge, and forecabin, which contain the usual accommodation for a vessel of this description, while both the upper and lower 'tween decks will be fitted for the conveyance of emigrants, the berths being entirely of iron, and portable, so as to be easily removed when the vessel is carrying cargo on her return voyage. On leaving the ways the vessel was named the *Italia* by Mrs. Shuman, and her building is being inspected by Mr. Van der Smisen and Mr. Brandt on behalf of the owners. Immediately after the launch the vessel was taken to the Wallsend Slipway and Engineering Co.'s works, where she will be fitted with powerful engines on the triple-expansion system, and which will embrace all modern improvements, and also forced-draught on the asphalt system.

**Deddington.**—On April 3rd there was launched from the shipbuilding yard of Messrs. John Priestman & Co., South, wick, a handsomely-modelled steel screw steamer, of the following dimensions:—Length, 280 ft.; breadth, 39 ft.; depth of hold, 19 ft. 6 in.; with a poop and raised quarter-deck aft-long bridge to foremast, and topgallant forecabin. She has been built to the order of Messrs. H. Sammon, Hull, is to have the highest class at Lloyd's, namely 100 A, and is designed to carry 3,100 tons of cargo. Water ballast tanks are fitted in the fore-and-aft holds, capable of containing about 500 tons. The main and quarter-decks are of iron. The cabin, with accommodation for captain and officers, is fitted under the poop, and the engineers' under the bridge amidships. She is schooner-rigged, with lower masts of steel, and is fitted with four large steam winches, made by Messrs. Welford Bros., Pallion, and the windlass by Messrs. Emerson, Walker, Thompson Bros., Limited. The engines, which are supplied by Mr. George Clark, Southwick, have cylinders 21 in., 35 in., and 57 in. diameter, with a stroke of 39 in., and are of about 1,000 indicated H.P. The working pressure of the boilers is 160 lb., and during construction they have been under the superintendence of Messrs. Flannery, Baggallay & Johnson, of London. The launch was in every way a complete success, the ship receiving the name of *Deddington* from Mrs. Bohm, wife of Mr. J. Bohm, of Hull.

**Lumen.**—On April 3rd there was launched from the Walker yard of Messrs. Sir W. G. Armstrong, Mitchell & Co., a steel screw steamer, specially built from the patent designs of Mr. A. F. Swan, for the carriage of petroleum in bulk. The vessel has been built to the order of Messrs. H. E. Moss & Co., of Liverpool and London, for the Lumen Steamship Co. Limited. Her dimensions are:—Length, 304 ft.; breadth, 37 ft. 9 in.; depth, 27 ft. 9 in. She has a total carrying capacity of 3,500 tons of oil and coal. She is built to the highest class of Bureau Veritas, under the superintendence of Mr. A. G. Schaeffer, of Newcastle. The vessel will be fitted throughout with the electric light, and will have a double set of Worthington pumps, &c. The steamer was named the *Lumen* by Mrs. Atkinson, daughter of the senior partner of Messrs. H. E. Moss & Co. The machinery is being manufactured by the Wallsend Slipway and Engineering Co., and is of the triple-expansion type, embracing all the latest improvements.

**Arndilly.**—On April 3rd Messrs. William Dobson & Co. launched from their shipbuilding yard at Low Walker a steel screw steamer, built to the order of Messrs. Adam & Co., of Aberdeen. The vessel is about 2,200 tons burthen, built to the highest class at Lloyd's, and will be fitted with triple-expansion engines by Messrs. Black, Hawthorn & Co., of Gateshead. The vessel was named the *Arndilly* by Miss Elsa Thiedmann, and was taken direct to Newcastle Quay to receive her machinery.

**Moonstone.**—On Wednesday, April 3rd, Messrs. Richardson, Duck & Co., launched from their building yard at South Stockton an iron screw steamer of the following dimensions:—Length over all, 287 ft.; breadth extreme, 37 ft. 5 in.; depth of hold, 30 ft.; tonnage, gross, about 2,058 tons. The vessel, which has been built to the order of Messrs. Christie & Co., Cardiff, is the seventh built for them by Richardson, Duck & Co. She has short poop, a raised quarter-deck, and a long bridge extending to stem, is classed 100 A 1 at Lloyd's, has double bottom on cellular principle in after and main holds, and under engines and boilers. She will be fitted with 4 steam

winches, steam steering gear, Emerson, Walker & Co.'s patent direct steam windlass, patent stockless anchors, and all modern improvements for facilitating the loading, discharging and manœuvring of the vessel. The engines are by Messrs. Thos. Richardson & Sons, Hartlepool; cylinders 21 in., 35 in., and 58 in. by 36 in. stroke. The vessel was named the *Moonstone*, the christening ceremony being gracefully performed by Miss M. J. Richardson, of Potto Hall, Northallerton.

**Norlands.**—On Wednesday, April 3rd, Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions:—Length over all, 270 ft.; beam, 36 ft. 6 in.; depth, 19 ft. 5 in.; and of 2,550 tons deadweight capacity, and built to the order of Messrs. Hardy, Wilson & Co., West Hartlepool. The vessel, which will take Lloyd's highest class, is of the well-decked type, with a poop having saloon and cabins, a raised quarter-deck joining a long bridge which is carried right up to forehatch, the engineer's berths being at the aft end while the crew are berthed in the fore part. The usual topgallant forecabin is fitted forward with Emerson, Walker & Co.'s windlass. The hull is built on the web-frame principle, large hatchways are fitted, four steam winches, hand and steam steering gear amidship, and screw gear aft, donkey boiler and double bottom under each hold for water ballast. Pole masts with fore-and-aft rig, boats on beams overhead, and everything complete will be provided for general trading. Fine triple-expansion engines, of 750 H.P., and two steel boilers to work at 150 lb. pressure per square in. are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. She was gracefully christened *Norlands*, by Mrs. Ralph H. Young, West Hartlepool. The hull and machinery have been superintended during construction by Mr. J. Maddison on behalf of the owners. It may be added that the *Norlands* is the ninth steamer built by Messrs. W. Gray & Co., Limited, for Messrs. Hardy, Wilson & Co.'s fleet.

**Khio.**—On Thursday, April 4th, Messrs. Edward Withey & Co., West Hartlepool, launched from their yard at Hartlepool, a steel screw steamer, built to the order of the Pinkney & Sons Steamship Co., Limited, Sunderland. The vessel is a fine type of a cargo boat, measuring over 310 ft. in length, and constructed of Siemens-Martin steel, with a large measurement and deadweight capacity and built to the highest class at Lloyd's. She has a long raised quarter-deck, short poop, long bridge house, and a topgallant forecabin. The holds are fitted with iron grain divisions, and iron cargo battens; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after holds the ship is built on the web-frame system, enabling the vessel to carry cargoes of the bulkiest description. Her cellular bottom (Withey & Sivewrights patent) is fitted all fore-and-aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey boilers, patent steam steering gear amidships, screw gear aft, direct steam patent windlass on forecabin, patent stockless anchors hauling up into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for passengers, captain, and officers is finished in polished hardwood with neatly-painted panels executed by the decorative staff of ladies employed by the firm. The vessel will be rigged as a two-masted fore-and-aft schooner, and will be fitted with triple-expansion engines by Messrs. S. Richardson & Sons, Hartlepool. The hull and machinery have been constructed under the personal superintendence of Captain T. Colling. On leaving the ways the vessel was gracefully christened *Khio*, by Mrs. Varley, wife of Alderman J. Varley, J.P., of Huddersfield, Chairman of the Company.

**Celtic.**—On April 6th Messrs. Earle's Shipbuilding and Engineering Co. launched the new steam fishing vessel *Celtic*, which they have built for the Grimsby Steam Fishing Co., Limited. This boat is similar to the *Arctic* and *Baltic*, recently completed for the same owners, and is intended for line as well as trawl fishing, her dimensions being 100 ft. by 20 ft. by 11 ft. 6 in. She is built to Lloyd's highest class, has provisions in the holds, in addition to the fish-well, for the storage of fish, ice, &c. The vessel has special trawl winches, and is fitted with two sets of trawl gear. She was towed after launching to the builders' dock, where she will receive her machinery, consisting of a set of a triple-compound three-crank engines, and a powerful steel boiler made for a working pressure of 150 lb. per square inch, which has also been made by the company. The vessel was named the *Celtic* by Miss Kitty Moody,

**Delmar.**—On Saturday afternoon, April 6th, Messrs. Raylton, Dixon & Co., launched from their No. 2 Dockyard the first steamer which has been built in this new yard, and which is No. 296 on their list. She is built to the order of Messrs. G. Tweedy & Co., of London and Odessa, of the following dimensions:—Length over all, 305 ft.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in., and will carry 3,600 tons deadweight. She is constructed on the most improved well-decked type, having the bulwarks of the well-raised flush with deck, one broad stringer carried along each side in place of gangway for communication with forecabin; water ballast throughout in cellular double-bottom iron decks, and will be fitted with engines of 210 H.P. by Mr. George Clark, of Sunderland. She is fitted with Emerson, Walker & Co.'s patent direct-acting steam windlass. The vessel, which has been built under the superintendence of Captain Whiteway, on leaving the ways was gracefully christened the *Delmar*, by Miss Hutchinson, of Norton. At this new yard Messrs. Raylton, Dixon & Co., have four other vessels in progress at the present time.

**Aldersgate.**—On Saturday, April 13th, there was launched from the shipbuilding yard of Messrs. C. S. Swan & Hunter, Wallsend, a steel screw steamer of the following dimensions:—Length, 300 ft.; breadth, 39 ft.; depth moulded, 22 ft. 3 in., built to the order of the Aldersgate Steamship Co., Limited, London, Mr. H. W. Dillon, Managing Director. The vessel, which has been built under special survey, is of the improved well-deck type with full poop, long raised quarter-deck, long bridge house, and topgallant forecabin. She has been classed 100 A 1 at Lloyd's, and in her construction the latest modern improvements have been introduced. The crew will be quartered under the bridge, instead of in the forecabin as formerly. Water ballast in a cellular double bottom, also in after deep tank. Improved steam winches for the rapid stowage and discharge of cargo, steam steering gear, and other appliances of the latest design will form part of the vessel's equipment. Her engines, which are of the triple-expansion type, have been built by Messrs. Blair & Co., Limited, Stockton-on-Tees, and are capable of indicating 1,200 I.H.P. On leaving the ways the vessel was named the *Aldersgate* by Miss Maud Hunter.

**Pocasset.**—On April 13th there was launched from the shipyard of Messrs. Robert Stephenson & Co., Limited, Hebburn, a large steel screw steamer for the Mediterranean and New York Steamship Co., managed by Messrs. Phelps Bros., of Liverpool and New York, this being the second vessel built and engined by Messrs. Stephenson for this line of steamers. The vessel is of the following dimensions:—310 ft. by 39 ft. by 27 ft. 6 in. She has been built to Lloyd's three-decked rule, and has a cellular bottom for water ballast. There are two steel decks, the upper one being sheathed with pitched pine, and she has a rudder of solid cast steel. She has been specially designed for the American fruit trade, her cargo holds being thoroughly ventilated by a most complete arrangement of air shafts communicating with Gibb's patent ventilator on deck. She will have both a Board of Trade and an American passenger certificate. The accommodation for the passengers, officers, and engineers is provided under a long bridge amidships. The saloon is tastefully fitted up in Hungarian ash and mahogany. Steam heating is applied to all the cabins, and steam fire extinguishing pipes are led into each cargo compartment. All the deck and other fittings are of the most improved description. There are five powerful steam winches by Messrs. Dunlop, Bell & Co., supplied with steam from a Blake's patent donkey boiler, and one of Harfield's steam windlasses is placed on the forecabin. The anchors are Hall's patent stockless type of cast steel, so arranged as to house into the hawse pipes, and Linklater's detaching gear is fitted to each of the lifeboats. The ship will be steered from amidships with one of Alley & Maclellan's sentinel steam steering gear, and from aft with a screw gear, and she is provided with one of Sir William Thompson's patent standard compasses and a patent sounding machine. The engines, which are of the tri-compound type, with cylinders 25, 39, and 62 in. diameter, having a piston-stroke of 42 in., have been constructed at the engine works of Messrs. R. Stephenson & Co., Limited, South Street, Newcastle. The vessel was named the *Pocasset* by Miss Hepburn, of Grosvenor Place, Jesmond.

**Undine.**—On April 15th Messrs. Cook, Welton & Gemmell launched from their yard, Hull, a steam fishing vessel, built for the Grimsby Union Steam Fishing Co., Limited, to the order of Messrs. Letten Brothers, fish salesmen, Grimsby. This vessel

is fitted with all the latest improvements for bringing live fish from Faro and Iceland, also for steam trawling. The machinery is being supplied by Messrs. C. D. Holmes & Co., engineers, Hull. Her dimensions are:—Length, 105 ft.; breadth, 20 ft. 6 in.; depth, 11 ft. 6 in.; and she is built in excess of Lloyd's 100 A 1 class. The vessel was launched and named the *Undine* by Miss Edith Smith, of Grimsby.

**Rhone.**—On April 16th this smart spar-decked steamer was launched by Messrs. Wigham, Richardson & Co., from their Neptune Shipbuilding Yard, Newcastle-on-Tyne. She is a sister ship to the *Felix Touache*, which was launched from the same builders' yard a month ago, and is now loading in the river. Both steamers are additions to the fleet of the Compagnie Anonyme de Navigation Mixte, of Marseilles, for their Marseilles and Algerian passenger service. The dimensions of the steamers are 260 by 32 by 25 ft., and the engines, which are triple-expansion (Tweedy's patent), are by the same builders. The launch took place in the presence of M. Matagrin, superintending engineer, M. Barry, French Consul at Newcastle, and several ladies and gentlemen, and as the vessel left the ways she was named the *Rhone* by Mlle. Maréchal, of Paris.

**Reggio.**—On April 16th Messrs. Irvine & Co., West Hartlepool, launched a fine new steel screw steamer, of the following dimensions:—Length over all, 240 ft.; beam, 32 ft.; depth of hold, 15 ft. 6 in.; fitted with all the latest improvements for quick loading and discharging. She has been built for Messrs. Ordeis & Handford, of Newport (Mon.), and was named *Reggio* by Miss May Irvine, daughter of Captain R. Irvine.

**Hazelmere.**—On April 16th Messrs. Robert Thompson & Sons launched from their shipbuilding yard at Southwick an iron screw steamer, built to the order of Messrs. F. A. Jacques & Co., Newcastle-on-Tyne. The dimensions of the vessel are:—Length, 230 ft.; breadth, 32 ft. 6 in., and depth, 15 ft. 4 in., and she has been built under Lloyd's special survey to class 100 A 1. She has a raised quarter-deck, with bridge and forecabin, and is fitted with water ballast. She has large self-trimming hatches, with three steam winches, patent steam steering gear, patent windlass, and all the latest improvements. The cabin is placed aft, and fitted up for the accommodation of the captain and officers, and the engineers are berthed under the bridge, the crew being in forecabin. The engines are by Messrs. Black, Hawthorn & Co., Gateshead-on-Tyne. As the vessel left the ways she was christened the *Hazelmere* by Miss Marshall, daughter of J. F. Marshall, Esq., of this town.

**Isleworth.**—On April 16th Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions:—Length, 310 ft.; breadth, 41 ft. 6 in.; depth, 23 ft. 4 in., built to the order of Messrs. Watts, Ward & Co., London, and classed A 1 at Lloyd's. The vessel is of the well-decked type with poop, containing saloon and cabins for officers, and a few passengers; long-raised quarter-deck; long bridge of extra strength right up to fore hatch, and containing crews' quarters at fore end and engineers' berths aft; open topgallant forecabin with Emerson, Walker & Co.'s direct steam capstan windlass. The hull is built on the web-frame principle dispensing with hold beams and giving a clear hold for stowing bulky cargo, large hatches are fitted, four steam winches, steam steering gear amidships, screw gear aft, two donkey boilers, and cellular double bottom throughout for water ballast. The rig will be schooner with double fore topsails and topgallant sail. The boats will be carried overhead on beams and a full equipment of modern appliances provided for general trading. The engines are on the three-cylinder triple-expansion principle. The hull and machinery are being superintended by Captain J. A. Hodgson and Mr. A. H. Alchin, respectively, on behalf of the owners. The christening ceremony was gracefully performed by Miss Scott, of Skipton-in-Craven, the vessel being named the *Isleworth*.

**Thornaby.**—On April 17th Messrs. Ropne & Son launched a steel screw steamer of the following dimensions:—Length, 269 ft.; breadth, 36 ft.; depth, moulded, 20 ft. 1 in. She has been built under special survey to class 100 A 1 at Lloyd's, and will carry 2,600 tons cargo and fuel on Lloyd's summer freeboard. The vessel has a short full poop, in which is fitted accommodation for captain and officers, raised quarter-deck, long bridge extended to foremast, short well, and cellular bottom for water ballast. She is built on the web-frame principle, and, having very large hatches, is well adapted for carrying heavy cargoes. She will have four steam winches, Meredith's patent multitubular boiler, Davis's steam-steering gear, Hastie's screw

gear aft, Emerson, Walker & Co's patent windlass, &c., with all the latest improvements for a first-class cargo steamer. Her engines are by Messrs. Blair & Co., Limited, on their improved triple-expansion principle of 800 H.P., with two steel boilers, working at 160 lb. The steamer has been built to the order of Messrs. R. Ropner & Co., West Hartlepool, and as she left the ways was named *Thornaby* by Miss Mabel Ropner, of Preston Hall, Stockton-on-Tees.

**Mombossa.**—On April 17th there was launched the screw steamer *Mombossa*, which has been built by Mr. James Laing, of the Deptford Yard, Sunderland, to the order of the British India Steam Navigation Co. Lord Hartington performed the christening ceremony. The *Mombossa* is the 485th vessel launched by the firm since 1793.

**Eastgate.**—On April 17th Messrs. T. Turnbull launched from their premises, Whitehall, Whitby, a well-modelled screw steamer of the following dimensions:—Length over all, 268 ft. 9 in.; length between perpendiculars, 258 ft.; breadth, 37 ft.; depth to top of cellular floor plate, 16 ft. 11 in. The vessel is classed 100 A 1 at Lloyd's, and her deadweight capacity is estimated at about 2,550 tons, at 18 ft. Her engines are by Messrs. Blair & Co., Stockton-on-Tees, and are 140 H.P. nominal. She has been built to the order of Messrs. Turnbull, Scott & Co., London, and was named the *Eastgate* by Mrs. Scott, Whitby.

**White Jacket.**—On April 18th Messrs. Joseph L. Thompson & Sons launched from their shipyard a steel screw steamer of 3,450 tons deadweight capacity, built to the order of Mr. George Hallett, of Cardiff. This vessel is built on the cellular double bottom and web-frame principle, and will be of the highest classification at Lloyd's. The engines, which are of 1,000 I.H.P., and of the triple-expansion type, have been built by Mr. John Dickinson, of the Palmer's Hill Engine Works. The boilers are of steel, of the multitubular form, having a working pressure of 160 lb. to the square in. The engines will be fitted with Mr. Dickinson's patent steel built crank shaft. The deck machinery consists of direct steam windlass, four horizontal steam winches, steam steering gear amidships, and patent screw gear aft, and large donkey boiler. The vessel will be rigged as a two-masted topsail schooner, and will have Wasteneys Smith's patent stockless anchors. The ceremony of naming the vessel the *White Jacket* was performed by Miss Mildred Hallett, daughter of the managing owner.

**Eba.**—On April 20th there was launched from the yard of Messrs. Raylton, Dixon & Co. of Middlesbrough, the steel screw steamer *Eba*, which has been built to the order of the English and American Shipping Co., Limited, London. The vessel is of the following dimensions:—Length, 305 ft. 8 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in., with a deadweight capacity of 36,000 tons. She is built with raised quarter-deck, long bridge, topgallant fore-castle, and water ballast throughout and generally fitted as a first-class cargo boat. Her engines which will be by Messrs. Richardson, of Hartlepool, are to have cylinders 28 in., 37 in., and 61 in. by 42 in. stroke. She is fitted with Wasteneys Smith's patent stockless anchors stowing up hawse pipes.

**Girgenti.**—On April 20th there was launched from the yard of Messrs. John Blumer & Co., Sunderland, the steel screw steamer *Girgenti* which has been built to the order of Messrs. R. Sloman & Co., Hamburg. The vessel is of the following dimensions:—Length, 250 ft.; beam, 32 ft. 2 in.; depth, 22 ft. 9 in.; with a deadweight carrying power of about 2,100 tons. She is built on the spar deck plan, with bridge amidships and topgallant fore-castle. Her engines will be fitted by the North-Eastern Marine Engineering Co., Newcastle-on-Tyne.

**Twin-Screw Passenger Launch.**—On April 22nd Messrs. Edwin Clark & Co. of Stroud, Glos., launched from their yard a shallow draught twin-screw passenger launch built to the order of Mr. J. Salter, of Oxford, to run on the upper Thames between Oxford and Kingston. Her length is 72 ft.; beam, 12 ft. 3 in.; depth, 4 ft. 6 in.; mean draught 1 ft. 3 in. She is decked forward and has a raised saloon aft, and will carry 120 passengers. She will be the largest launch navigating the upper Thames, and is specially designed to make the least possible wash in narrow channel when steaming at 10 miles an hour.

## LAUNCHES.—SCOTCH.

**Kinloch.**—On Friday, March 22nd, the steel screw steamer *Kinloch* was launched from Messrs. A. M'Millan & Sons' Dockyard at Dumbarton. She is 265 ft. long; 37 ft. broad; and 19 ft. 11 in. deep. Engines of the triple-expansion type will be fitted in this case by Messrs. D. Rowan & Sons. The diameter of the cylinders is 20 in., 33 in. and 53 in. respectively, with a piston stroke of 36 in. The *Kinloch* has been built for Messrs. James Gardiner & Co., Glasgow.

**Glencaird.**—On Friday, March 29th, Messrs. Russell & Co. launched from one of their two yards at Port Glasgow, a four-masted sailing ship named *Glencaird*, of 2,600 tons. The length of the vessel is 313 ft.; breadth, 42 ft.; depth, 24 ft. 6 in. She is owned by Messrs. W. T. Dickson & Sons, Liverpool, and is a duplicate of the *Sir Robert Fernie*, built a short time ago by the same firm.

**Inverurie.**—On March 30th there was launched from the shipbuilding yard of Messrs. A. Hall & Co., Footdee, Aberdeen, a steel sailing ship named the *Inverurie*. The vessel is built to the order of Messrs. George Milne & Co., shipowners. She has been built for the highest class at Lloyd's, and her dimensions are as follows:—Length, 242 ft.; breadth, 37 ft.; depth, 21 ft. 6 in.; with a gross register tonnage of 1,411 tons. The new vessel will be barque-rigged, and her masts and yards are made of steel. She has been fitted up with all the latest and most improved appliances for the loading and discharging of cargoes, and is intended to be engaged in the Eastern trade.

**Kopernikus.**—On March 30th a steel screw steamer was launched from the yard of Messrs. S. & H. Morton, shipbuilders, Victoria Dock, Leith, and was named *Kopernikus*. The dimensions of the vessel are:—Length, 180 ft.; breadth, 28 ft.; and depth, 15 ft. She is built to carry 800 tons. The builders are to fit her with tri-compound engines with 13½ in., 22 in., and 30 in. cylinders, having a stroke of 30 in. She is built to the order of Messrs. Marcus Cohn & Sohn, Königsberg, and will be employed in the Baltic trade.

**Colonist.**—On April 2nd Messrs. J. Mackenzie & Co., boat builders, Leith, launched from their yard a wooden steam vessel 60 ft. in length, 14 ft. in breadth, 7½ ft. in depth, built to the order of Messrs. Messina Brothers, Port Elizabeth. The vessel, which was named the *Colonist*, will be supplied with compound-surface condensing engines 11 by 21 in. and 18 in. stroke, capable of driving the vessel at a speed of 9 knots an hour. The *Colonist* is to be employed as a tender to the mail steamers calling at Port Elizabeth.

**North Carr Lightship.**—On April 2nd there was launched from the shipbuilding yard of Messrs. Alexander Stephen & Sons, Dundee, a wooden vessel which has been built by them to the order of the Board of Trade for service as a lightship at the North Carr in room of the Trinity House yacht presently moored there. The new lightship is 104 ft. in length, 23 ft. 8 in. in breadth, and 11½ ft. deep, her gross tonnage being 163. She has been built exceptionally strong—much beyond the highest class at Lloyd's for such a class of ship. In a few days the vessel will be removed to Leith, where her machinery will be erected by Messrs. Hawthorne, of that port.

**Pladda.**—On April 2nd there was launched from the Caledon Shipbuilding Yard of Messrs. W. B. Thompson & Co., Limited, Dundee, an iron screw steamer of about 1,100 tons, named the *Pladda*, being the largest and latest addition to the fleet of the Clyde Shipping Company, Glasgow. This is the third steamer built at the Caledon Shipyard for this company, the previous two being the *Edystone* and *Portland*. The principal dimensions of the *Pladda* are:—Length, 252 ft.; breadth, 33 ft. 6 in.; depth of hold, 16 ft. She has been built to the highest class at Lloyd's, and is intended for the company's London and Glasgow trade, which is becoming yearly more popular as a tourist route. At the after end of the vessel more than ordinary space has been arranged for, allowing all the state-rooms to be of large and uniform size. There are five watertight bulkheads, and the three holds have four steam cranes and two steam winches conveniently placed for the rapid handling of cargo. Water ballast is fitted under the after hold and in the forepeak, to ensure a suitable trim for the vessel irrespective of the quantity and nature of the cargo. Steam steering gear by Messrs. Muir & Caldwell, Glasgow, is fitted in an iron wheel-house at the front of the poop-deck. Under the after end of the poop handsome and roomy accommodation is provided for 80 first-class passengers. From stem to stern the *Pladda*

has been fitted with the electric light. Below the fore-castle deck, rooms are fitted for the crew and deck passengers. On the main deck along the ship's side, from the forepart of the poop to the afterpart of the fore-castle, the deck space is occupied by stalls for the conveyance of about 100 head of cattle, and under the forepart of the poop, horse stalls have been erected. The engines, constructed at Messrs. Thompson's Tay Foundry, are of the triple-expansion type, having cylinders 23, 38, and 61 in. respectively, with a piston-stroke of 48 in., each engine working on a separate crank. Steam is supplied by two multitubular boilers, constructed to Board of Trade and Lloyd's requirements for a working pressure of 156 lb. per square in., each boiler having three of Fox's patent corrugated flues. The machinery and boilers are considerably in excess of Board of Trade and Lloyd's requirements. The specifications of hull and machinery were drawn up by Mr. Hamilton, engineer to the company, and carried out under his superintendence and that of Mr. John Wylie, the company's shipwright.

**Indramayo.**—On April 3rd the London & Glasgow Engineering and Iron Shipbuilding Co., Limited, successfully launched from their yard at Govan, a steel screw cargo steamer for a Liverpool firm, intended for trade with the East. The dimensions of the vessel are:—Length, 400 ft.; breadth, 45 ft.; depth, moulded, 31 ft. 6 in.; gross tonnage about 4,500 tons. She is fitted with water ballast in double bottom, and built to highest class for hull and machinery at Lloyd's and Bureau Veritas. The most approved appliances for the loading and discharging of cargo have been provided, so as to ensure prompt and economical working of the ship. The engines, which will be supplied by her builders, are of the triple-expansion compound three-crank type, embracing the most recent improvements, steam being supplied by two large double-ended boilers, and will be capable of indicating about 3,000 H.P. The vessel was named the *Indramayo* by Miss Allison, Paisley, and Miss C. Y. Macvicar.

**Loch Katrine.**—On April 3rd there was launched from Camperdown Shipbuilding Yard, Dundee, a steamer which has been built by Messrs. Gourlay Brothers & Co. to the order of the Dundee Loch Line Steam Shipping Co. Her dimensions are:—257 ft. 6 in. in length, 35 ft. 10 in. in breadth, and 18 ft. in depth. She has been built to carry 2,250 tons, with a mean draught of about 17 ft. 6 in., and owing to this light draught she will be employed in the shallow ports of the Baltic and Black Sea. She has four large cargo hatches, and has been fitted with all the most improved appliances, including steam winches, steam steering gear, and steam windlass. She will be supplied with triple-expansion engines of 160 H.P., the cylinders being 20 in., 32 in., and 52 in. respectively in diameter, with a stroke of 86 in. There are two steel boilers, 12 ft. in diameter, to be worked to a pressure of 165 lb., and two large donkey boilers, sufficient in size to work a cargo expeditiously from all the holds at the same time. Miss Nicoll, a daughter of Mr. Alexander Nicoll, of Riverleigh, a director of the company, christened the vessel the *Loch Katrine*.

**Strathendrick.**—On April 4th Messrs. Russell & Co. launched a steel screw steamer of the following dimensions:—Length, 298 ft.; breadth, 40 ft.; depth, 19 ft. 6 in.; carrying capacity, 3,600 tons. The new steamer is named the *Strathendrick*, and has been built for Messrs. Burrell & Sons, Glasgow. Messrs. James Howden & Co., Glasgow, will supply the engines.

**Silver King and Golden Hope.**—On April 6th Messrs. Mackie & Thomson launched, from the Govan Shipbuilding Yard, the first two vessels launched there by them. Many years ago the yard was occupied by Messrs. Dobbie & Co., who did a large business; but for several years it has been vacant. The new firm have shared in the general trade prosperity and since opening have annexed more ground. They have eleven vessels in their order book. The vessels launched are named *Silver King* and *Golden Hope*, built to the order respectively of Messrs. James Leyman and W. R. Leyman, for the North Sea Fisheries. They have been constructed of iron and are 100 ft. long by 20 ft. 6 in. beam, and 11 ft. 6 in. deep, and are fitted with all the necessary appliances for North Sea trawlers, including a winch specially adapted for the trade. The engines are of the triple-expansion type, and have been constructed by Messrs. Muir & Houston, Glasgow. The cylinders are 11 in., 16½ in., and 27 in. in diameter respectively, and have a piston stroke of 22 in. The boilers are to work to a pressure of 160 lb. to the square in.

**Calypso.**—On April 12th Messrs. Scott & Co., shipbuilders, launched from their yard at Greenock, an iron screw steamer of 535 tons gross tonnage, and of the following dimensions:—Length, 190 ft.; breadth, 30 ft. 6 in.; depth, 11 ft. 9 in. She will be supplied by the builders with compound engines of 500 H.P., having cylinders of 19½ in. and 88 in. and piston stroke of 30 in. She was named the *Calypso* as she left the ways. She is built to the order of the Ocean Steamship Co., Liverpool, and is intended for the Straits Settlements coasting trade.

**Modjeska.**—On April 13th Messrs. Napier, Shanks & Bell of Yoker, launched the *Modjeska*, a steel twin-screw steamer, specially designed and built to the order of the Hamilton Steamboat Co., Hamilton, Ontario, for passenger service on the Canadian lakes. Her dimensions are:—Length over all, 185 ft.; breadth at main deck, 30 ft.; depth, moulded, 13 ft.; gross tonnage about 500 tons. The general arrangements of the vessel are of the American type, embracing main and promenade decks the whole length of the vessel, and a wood awning above extending from foremast to the stern. The vessel is to have a high rate of speed, so as to make two runs per day between Hamilton and Toronto. At the launch the owners were represented by Mr. H. Fairgrieve, and the vessel was named by Miss Nellie McIlwraith, of Hamilton, Ontario.

**Alford.**—On April 13th a steel screw steamer of 1,940 tons was launched by Messrs. Hall, Russell & Co., Aberdeen. The vessel, which was built for the Adam Steamship Co., is schooner-rigged, and is 280 ft. in length and 37 ft. in breadth, with a depth of hold of 21 ft. 6 in. She will be fitted with triple-expansion engines of 210 H.P. nominal, and two steel boilers with a working pressure of 160 lb. per square inch. The steamer, which was named the *Alford*, is intended for the Mediterranean and Atlantic trades. The christening ceremony was performed by Miss Frances Adam, daughter of Mr. Thomas Adam, jun., of the Adam Steamship Co.

**Franklin.**—On April 13th there was launched from the shipbuilding yard of Messrs. Wm. Hamilton & Co., Port-Glasgow, a handsome steel screw steamer, named the *Franklin*, of the following dimensions, viz.:—Length, 260 ft.; breadth, moulded, 37 ft.; depth, moulded, 19 ft. 3 in.; gross register tonnage, 1,800; deadweight capacity, 2,650 tons. This vessel has long, raised quarter-deck, long bridge to foremast, and topgallant fore-castle, water ballast throughout in cellular double bottom, and is fitted with all the latest modern improvements for dispatch in loading and discharging. She will be fitted with triple-expansion engines of 150 H.P. nominal by Messrs. Alley & McLellan, Glasgow. This steamer has been built to the order of Messrs. Ballingall & Garroway, Glasgow, and is intended for the Baltic, Mediterranean, and Atlantic trades.

**Calais-Douvre.**—On April 13th the Fairfield Shipbuilding and Engineering Co., Govan, launched a paddle steamer for the London, Chatham, and Dover Railway Co.'s service between Dover and Calais. The vessel was named *Calais-Douvre* by Mrs. R. S. White, wife of one of the directors of the Fairfield Co. The *Calais-Douvre* is similar in design to the paddle steamers *Victoria* and *Empress*, built by the same firm, having a rudder at each end, inside the stem, to facilitate her leaving the harbour. The dimensions are:—Length between perpendiculars, 325 ft.; breadth, 36 ft.; depth, moulded, to upper deck, 21 ft. 6 in. She has been built entirely of steel, and divided by nine water-tight bulkheads. The after part of the vessel on the lower deck is fitted up entirely for first-class passengers, with ladies' saloon and main saloon extending the whole width of the vessel. Forward of the main saloon is a refreshment bar, fitted with large tables, revolving chairs, &c. Entrance is obtained to the saloon and cabin by large stairways from the main deck. On the main deck there is a large state-room and several private cabins for the use of parties desiring to travel privately. Aft on the same deck is a large smoking saloon. Aft the paddle-boxes there is only a bulwark, while forward the sides of the ship are carried to the promenade deck, thus affording sheltered promenading space for second-class passengers. Cabin accommodation for them is provided forward, where also the crew are housed. The chart-house is the only building on the promenade deck with the exception of the usual skylights, and over the chart-house is carried a bridge deck. The engines are of the compound diagonal, direct acting type. The cylinders are 59 in. and 106 in. in diameter respectively, with a stroke of 6 ft. The high-pressure cylinder is placed above the low-pressure, and in general arrangement the engines are similar

to those of the *Empress* and *Victoria*. The main working parts are of forged mild steel. The paddle shafts, cranks, and crank-pins are of Messrs. Brown's steel, and the shafts and pins are hollow to reduce weight. The water for condensing will be circulated by a centrifugal pump driven by a separate engine. The paddle wheels have feathering floats, and, together with paddle arms, feathering rods, &c., are of steel. Steam is to be supplied from four double-ended boilers, 13 ft. 3 in. in diameter and 16 ft. 3 in. long, having in all 24 corrugated furnaces, 3 ft. 5 in. in diameter. The working pressure is 110 lb. to the square inch. Fans and engines are provided for supplying air to the stokehold. She has been coated with the composition of Messrs. Suter, Hartman, & Rahtjen's Compositive Co., Ltd.

**Rosary.**—On Monday afternoon, April 15th, there was launched from Messrs. Ramage & Ferguson's shipbuilding yard at Leith, a steel screw steamer named the *Rosary*, built to the order of Messrs. Harris & Dixon, 81, Gracechurch Street, London. Her dimensions are 230 ft. by 32 ft. by 16 ft. 4 in. depth moulded, and the deck erections include a poop and raised quarter-deck aft, long bridge and topgallant fore-castle. The engines, which are triple-expansion and made by the builders, have cylinders 20 in., 33 in. and 54 in. diameter, by 36 in. stroke, supplied with steam from two single-ended steel boilers. She is fitted with patent steam capstan windlass by Emerson Walker & Co. The *Rosary* on leaving the ways was named by Miss Lockhart, of Belleisle, Polwarth Terrace, Edinburgh.

**Craigerne.**—On April 15th Messrs. Robert Duncan & Co. shipbuilders, Port Glasgow, launched a four-masted steel sailing ship of 1,800 tons net register for Mr. R. R. Paterson, Greenock. Her principal dimensions are—Length, 260 ft.; breadth, 40 ft.; depth of hold, 23 ft. 8 in., capable of carrying 3,100 tons dead-weight. This vessel, which is built to Lloyd's highest requirements, is a sister ship to the *Oceana*, built about two years ago by Messrs. Robert Duncan & Co. for the same owner. On leaving the ways she was named *Craigerne*, and was afterwards towed into Port Glasgow harbour to fit out. She will load at Glasgow for Sydney, and will be under command of Captain Quail.

**Hong Kong.**—On April 15th Messrs. Caird & Co. Greenock, launched the second of four cargo steel screw steamers for the Peninsular and Oriental Steam Navigation Co. for the East India and China trade. Her name is *Hong Kong*, and her principal dimensions are—350 ft. by 42 ft. by 29 ft.; net registered tonnage, 2,047; gross, 3,168; and carrying capacity, 5,100. She will be supplied by her builders with triple-expansion engines of 2,200 H.P.I., and two double-ended steel boilers will be able to sustain working pressure of 160 lb. to the square in. There will be accommodation for 30 first-class passengers. The two remaining steamers are in a forward state of construction. The *Hong Kong* is a duplicate of the *Bombay*, launched a month or two ago.

**Amy.**—On April 16th Messrs. John Fullerton & Co. launched from Merksworth Shipbuilding Yard, Paisley, an iron screw steamer of 150 tons, named the *Amy*, built to the highest class at Lloyd's, and fitted with all the latest improvements. The steamer is being supplied with engines by Messrs. Walker, Henderson & Co., Glasgow, and has been built to the order of James Neill, Esq., Bangor, County Down, Ireland, and is intended for his special trade.

**Glenmark.**—On April 16th Messrs. Russell & Co. launched from their east and Port Glasgow yard a 1,300-ton steel sailing barque for Messrs. W. O. Taylor & Sons, Dundee, named the *Glenmark*, of the following dimensions:—Length, 230 ft.; breadth, 36 ft.; depth, 21 ft. 9 in. Immediately after the launch the vessel was berthed in the East Harbour at Port Glasgow to fit out. The builders will lay down the keel of another vessel of almost similar dimensions on the vacant ways.

**Craigend.**—On April 17th Messrs. Russell & Co. launched from their Kingston yard a four-masted steel sailing ship of the following dimensions:—Length, 278 ft.; breadth, 42 ft.; depth, 24 ft. 6 in.; net register tonnage, 2,200 tons. On leaving the ways the new vessel was named the *Craigend*. She has been built to the order of a Glasgow firm, and will fit out at the James Watt Dock, Greenock.

**Hydarnes.**—On April 18th Messrs. John Reid & Co. launched from their shipbuilding yard, Port Glasgow, a steel screw steamer, the *Hydarnes*, built to the order of Messrs. R. P. Houston & Co., Liverpool, for their line of passenger and cargo

steamers between Liverpool and the River Plate. This vessel has been specially designed for the conveyance of heavy machinery cargoes, her hatches being proportionately large. Her deadweight capacity is 4,500 tons, and she is provided with ample saloon accommodation. She is a sister ship to the *Helopes*, launched by Messrs. Reid & Co. about the middle of February for the same owners.

#### LAUNCHES.—IRISH.

**Hippomenes.**—On April 3rd Messrs. Workman, Clark & Co., Limited, Belfast, launched a steel screw steamer, built to the order of Messrs. R. P. Houston & Co., Liverpool, for their River Plate trade. Dimensions:—Length, 320 ft.; breadth, 40 ft.; depth, 26 ft. She is classed 100 A 1 at Lloyd's, and is of the spar-deck type of steamer, with topgallant fore-castle, and bridge deck. The crew are accommodated forward between the spar and main decks, the officers and engineers being housed in the bridge wing houses. Accommodation is provided in a large deck-house at the stern for a number of passengers. The steamer is provided with steam winches and all derricks necessary for the rapid working of cargo. She has a steam capstan windlass of Clarke Chapman's patent, and a steam steering engine of Harrison's patent. The vessel has a double bottom throughout on the cellular system, with a capacity of 575 tons. Her machinery will be supplied by Messrs. Bow, M'Lachlan & Co., Paisley, and is of the triple-expansion type. As the vessel left the ways she was named *Hippomenes*.

**Embericos.**—On April 17th a fine new steel steamer was launched from the shipbuilding yard of Messrs. MacIlwaine & M'Coll, Limited, Belfast. The new vessel has been built to the order of Mr. A. Embericos, of Braila, and is destined for the Black Sea and Danube trade, being specially adapted for grain in bulk. Her dimensions are:—Length, 275 ft. between perpendiculars; breadth, 88 ft. moulded; depth, 20 ft. 4 in. moulded. She is classed 100 A 1 at Lloyd's, her type being "well-deck," with long fore-castle, and long bridge and poop. She will be fitted with machinery of the most improved pattern, having triple compound engines, three-crank, with cylinders of 21½, 36, and 59 in. diameter, 42-in. stroke, and capable of indicating 1,400 H.P. The boilers, which are of steel, are three in number, and are ganged to 160 lb. pressure. The consulting engineers are Messrs. William Esplen & Son, Liverpool, who drew up the specifications, and under whose inspection the vessel was constructed. The ceremony of naming the new vessel the *Embericos* was performed by Miss Esplen, and the launch was in every respect successful.

#### LAUNCHES.—DANISH.

**Rosenborg.**—On March 26th a new steamship was launched from the yard of the Burmeister and Wain Shipbuilding and Engineering Co., Limited, at Copenhagen. She is built on account of the Danish Steamship Co., Dannebrog, and the following are the principal dimensions:—Length, 250 ft.; breadth, 34½ ft.; and depth, 19 ft. The new steamer, which has been christened *Rosenborg*, will be fitted with triple-expansion engines.

**Sundsvall.**—On March 29th the new steamship *Sundsvall* was launched from the yard of the Elsinore Iron Shipbuilding Co., Elsinore, Denmark. It is built on account of Mr. H. M. Gehrorens, Hamburg, and is constructed entirely of steel. The principal dimensions are:—Length, 190 ft.; breadth, 27½ ft.; and depth in the hold, 13 ft. 7½ in. The engine is a compound engine with surface condenser, and is intended to indicate 480 H.P. The *Sundsvall* is intended for the Hamburg, Stockholm, Sundsvall, and Gelle trade. After the launch the keel was laid for a new steamer of 2,400 tons.

#### TRIAL TRIPS.

**Marathon.**—On March 22nd the *Marathon*, built by the Fairfield Co., Govan, and engined by Messrs. R. & W. Hawthorn, Leslie & Co., Newcastle-on-Tyne, underwent on the Clyde a preliminary trial of her machinery prior to her departure. The machinery was tried under forced draught for over two hours and a half, the engines working with great smoothness and regularity at an average speed of 120 revolutions per minute.

The trial was satisfactory in every sense. The *Marathon* has since arrived at Portsmouth, where she will be docked for purposes of survey and coppering, afterwards undergoing her engine trials under natural and forced draught.

**Imperial.**—On March 23rd the fine, new screw steamship *Imperial*, just completed by Messrs. Laird Bros. for the Compañia Sud Americana de Vapores, of Valparaiso, having on March 18th made a very successful preliminary trial trip was taken out for her official trial, when a large party comprising a number of ladies and gentlemen, among the latter many friends of the owners, and others connected with the West Coast trade, took advantage of the fine day for a pleasant cruise. The company was officially represented by Mr. Thomas Dewsbury, of Leeds, their agent in England, and Captain Stewart, who takes command of the vessel, was also on board. The *Imperial* left the Alfred Dock about 3 a.m., and was under weigh for about 12 hours, docking again on the afternoon tide. Having since her preliminary trial taken on board a very large quantity of coal in order that she may steam to the West Coast without filling up at any port of call, the vessel was deeply laden and somewhat out of trim, but in spite of these circumstances the result of several runs between the N. W. and Bar Lights, gave a speed of over 14 knots, the machinery working with perfect smoothness and developing about 3,000 I.H.P., which proved that when in proper working trim the contract speed of 15 knots would be reached with ease. The trial was considered highly successful in all respects. The vessel has been selected by the Chilean Government for the conveyance of about 700 emigrants from France, and sailed at once for Bordeaux, where she embarked them. The *Imperial* is intended for the Company's service on the West Coast of South Africa, and is very similar to, but of larger dimensions and power than the *Cachapoal* and *Mopoch*, built by Messrs. Laird for the same owners some years ago, and which have made a reputation on the coast. She is a very handsome vessel with a clipper stem, with a figurehead representing a water nymph, and an elliptic stern, and is rigged with three pole masts. She is fitted for water ballast, and provided with steam windlass, steam steering gear, and six steam winches. She also has a complete electric lighting installation, and all the latest and most approved appliances as a first-class passenger steamer. One of the boats carried is a steam launch. Her dimensions are:—Length, 333 ft.; beam, 41 ft.; depth of hold, 23 ft.; tonnage, 2,758 tons o.m., and she is propelled by a set of triple-expansion engines, having cylinders 31, 49 and 75 in. in diameter by 54 in. stroke, supplied with steam at 150 lb. pressure, by two double-ended steel boilers, with six of Fox's corrugated furnaces in each. To meet the special requirements of the trade and secure perfect ventilation, the sides between main and spar decks have been left open, the spar deck being supported on stanchions, and the whole of the accommodation for first-class passengers and officers provided in spacious deck-houses on that deck, under cover of the shade deck, which affords a magnificent promenade the whole length and width of the ship, and is protected by canvas awnings. There is accommodation of the most sumptuous character for about 160 first-class passengers in a saloon the full width of the deck-house, above which is the social hall arranged for music-room, card-room, smoking-room, &c., lighted by a large and beautifully-designed cupola skylight, and like the saloon, panelled in hard-woods, and artistically decorated with paintings and other ornamental work; thorough ventilation and light being secured to the saloon by a central aperture in the floor of the social hall. A number of third-class passengers are comfortably provided for on the main deck, and there is space for a large number of cattle.

**Bombay.**—On March 23rd the *Bombay* (s), built by Messrs. Caird, of Greenock, for the Peninsular and Oriental Steamship Co., made her trial trip. On the measured mile at Skelmorlie, with 2,500 tons on board, the vessel attained a mean speed of 12½ knots, which is considerably above the contract rate. In the steering tests also she behaved admirably. The *Bombay* is a cargo steamer, intended for the India and China trade. She is a schooner-rigged vessel of 2,047 tons net. Her dimensions are:—Length, 350 ft.; breadth, 42 ft.; and depth, moulded, 29.9 ft.; and her carrying capacity is 5,100 tons deadweight. She is built of steel, has a cellular double bottom, and is divided into watertight compartments. Although primarily a cargo steamer, the vessel has accommodation for about 80 first-class passengers. The ship is lighted throughout

with the electric light. If necessary the vessel may be utilised as a troopship or as a cruising collier, lighting and ventilation having been specially looked to, and sufficient deck space secured for coaling boats. The engines are triple-expansion, and are of 4,500 nominal and 2,200 indicated H.P. For the easy handling of the vessel and cargo the most approved appliances have been fitted.

**Trewellard.**—On Thursday, March 28th, the new steel screw steamer *Trewellard*, built by Messrs. John Readhead & Sons, West Docks, South Shields, was taken to sea on her trial trip. The dimensions of this steamer are 290 ft. by 39 ft. by 20 ft., classed 100 A 1 at Lloyd's under special survey, is of the improved well-deck type, and is fitted up with shifting boards, &c., as required by Grain Cargoes Act. The engines are of the triple-expansion type, having cylinders 28 in., 37½ in., and 61½ in., with 39 in. stroke, steam being supplied at a pressure of 160 lb. per square in. by two large steel boilers. On the trial the engines worked very smoothly and satisfactorily. Several runs were made on the measured mile and along the coast, and the mean speed attained was 11½ knots per hour. The *Trewellard* has been built to the order of Messrs. Edward Hain & Son, St. Ives, Cornwall.

**Nil Disperandum.**—On Friday, March 29th, the steam trawler *Nil Disperandum*, of Hull, made her trial trip. This fishing vessel has been built to the order of the Humber Steam Trawling Co., Limited. An excellent run was made down the Humber, and when the Middle Lightship was passed a patent self-registering log was thrown overboard, and a 20 mile run was made to sea at a mean of 10½ knots per hour—a return which was deemed highly satisfactory. *Nil Disperandum* is 100 ft. long, 20 ft. 9 in. broad, and 11 ft. deep. She is propelled by engines of 45 H.P. nominal, which work up to 270 indicated. The cylinders are 17 in. and 33 in., with 22 in. stroke. Steam is supplied by a single-ended boiler 11 ft. in diameter, and 9½ ft. long. The vessel has been fitted with all the latest improvements.

**Star of England.**—On March 30th this steamer, built by Messrs. Workman, Clarke & Co., of Belfast, for Messrs. J. P. Corry & Co., of London and Belfast, went down the Clyde and completed her loading at the Tail of the Bank. The official trial trip took place on April 2nd, and with 5,700 tons dead weight cargo on board, steamed on several runs on the measured mile 11 knots per hour. The engines indicating 2,000 H.P., and the light appearance of the vessel would not indicate such a cargo being on board. The engines, on the triple-expansion type, constructed by Messrs. John & James Thomson, during the day were driven at full speed for six hours, when, everything being satisfactory, the vessel proceeded direct on her voyage to Bombay. At the luncheon Mr. John Corry, in the absence of Sir James Corry, Bart., presided, and Mr. Workman on behalf of the builders. There were also present Mr. William Corry, son of Sir James; Mr. James M. Thomson, and others.

**Rock Light.**—On April 2nd this vessel, which has been built by Messrs. Oswald, Mordaunt & Co., of Southampton, for the petroleum bulk carrying trade, was taken on her trial trip. Her principal dimensions are:—Length, 323 ft.; beam, 40 ft. 3 in. and 30 ft. 3 in., moulded depth. She will carry 3,800 tons of oil and 400 tons of coal at load draft. She has been built under the inspection of Messrs. Flannery, Bagallay & Johnson, of London and Liverpool, from their specifications, but upon the builders' designs. She has triple-expansion engines also by the builders, with cylinders 22½ in., 37 in., and 61 in. diameter, and 39 in. stroke, supplied with steam from 3 boilers each, 12 ft. 3 in. diameter, working at 170 lb. pressure. The valve-gear is Joy's patent, and there is a feed-heating apparatus. She has Gwynne's patent circulating pump which, on the trial easily maintained a vacuum of 26 in. During a continuous run of six hours' duration, the engines worked with unusual smoothness, with no water on the bearings, and without a hitch. Four runs were made on the measured mile, and a true mean-speed of 10½ knots was attained. The system of pumping for cargo discharge and intake is unusually complete, and comprises three pumps, two of them aft and one forward, there being seven orifices in the ship's side, which, by the arrangement of the connections in board, are capable of being used either as suction for taking in the cargo or discharge orifices for landing it. The whole of this system of piping was tested and found to work satisfactorily, and it is estimated to be capable of discharging the whole of

the cargo in less than 30 hours. The electric light was also tested satisfactorily. The vessel is built to the highest class of both Lloyd's Registry and Bureau Veritas.

**Atalanta.**—On April 3rd the steel screw steamer *Atalanta* went on her trial trip on the Tyne, and easily attained her guaranteed speed over a long run of 16 knots per hour, her best run being 16½ knots after allowing for tide. The weather was not favourable for the trial, there being a strong N.E. wind and heavy sea. The steamer has been built and engined by Palmer's Shipbuilding Co. for the Atalanta Steamship Co., Limited, to designs of Mr. John White, of London, to run in Messrs. John E. Kerr & Co.'s line of fruit steamers between Jamaica and New York. She has large boiler power, is fitted with Thos. Henderson's patent self-cleansing furnaces, and proved on her trial to have ample steam without heavy firing—so common in the high speed boats—and the absence of vibration was very remarkable. The holds, cabins, engine-room, stokeholes, and crew's quarters, are fitted with electric light on Holme's system, which on the trial worked most satisfactorily. The passenger accommodation is in a house on deck forward. There are only two passengers in each state room, and comfort seems to have received careful study. The system of ventilation of all the holds appeared very perfect. This steamer is a practical example of the extension of the West India fruit trade, the vessel being the fifth Messrs. Kerr have placed in this trade.

**Asiacoe.**—On April 6th the s.s. *Asiacoe*, which has been built by Messrs. Raylton, Dixon & Co., of Cleveland Dockyard, left her builders' yard for her trial trip to the Tyne. She is a steel vessel of over 3,700 tons burden, and of the following dimensions:—Length, 305 ft.; breadth, 42 ft.; depth, moulded, 21 ft. 4 in., built to the highest class of Lloyd's on the well-decked principle, having bulwarks of well raised to level of fore-castle and bridge. She has extra large hatchways and every convenience for the stowage of timber and cargo of extreme dimensions. Convenient accommodation for captain, and spare berths are placed in the poop aft. Her engines having cylinders 23 in., 37 in., and 61 in. by 42 in., by Messrs. Blair & Co., of Stockton, worked with complete success on trial trip.

**Pharos.**—On April 8th the steamship *Pharos*, of the Moss line, went down the Mersey for the official trial of her machinery. The *Pharos* has been laying up for the last few weeks, having her engines converted to triple-expansion, with three cranks and new high-pressure boilers fitted. The *Pharos* is a steamer of 2,289 tons gross, she is 380 ft. long by 35 ft. broad, and has a hold depth of 23 ft. 6 in. When the vessel was new the compound cylinders were 85 in. and 70 in. in diameter respectively, and these have been replaced by three cylinders, 22½, 36 and 60 inches diameter, by 48 in. stroke. Her new boilers are single ended, working at 150 lb. per square inch; they are 14 ft. 6 in. diameter, by 10 ft. 6 in. long, fitted with Purvis's patent ribbed furnaces. The performance of the machinery was highly satisfactory, the engines running smoothly at 64 revolutions per minute, and the vessel attained a mean speed of 12 knots per hour. All the work has been carried out by Messrs. Rollo & Sons, of Fulton Engine Works, to the specification and under the superintendence of Messrs. William Esplin & Son, the company's consulting engineers.

**Antoinette.**—On April 9th the official trial trip of the s.s. *Antoinette* took place, the vessel leaving Smith's Buoy, North Shields, at 11 a.m. The ship, which is 224 ft. B.P. long, breadth, 34 ft., depth, 9 ft. 1 in., has been built to the order of Mr. C. A. Jones, of Monte Video, by Messrs. S. & W. Smith, of North Shields and Newcastle, and is intended for general trade in the River Plate. The engines, which are twin-screw, of the triple-expansion type, have been built by Messrs. Ernest Scott & Co., Close Works, Newcastle-on-Tyne, and are fitted with cylinders 11 in., 17 in., 28 in. by 21 in. stroke; and a large steel boiler made by Mr. J. S. Eltringham, South Shields, 13 ft. diameter by 10 ft. long, fitted with three Fox's corrugated furnaces, 38 in. diameter, for a working pressure of 160 lb. per square in. The crank shaft and all principal working parts are of steel; the bearings are lined with white metal throughout. Although the weather was by no means suitable for a speed trial, the engines, we are informed, ran most satisfactorily, and upon arrival in the Tees the vessel was tried on the measured mile, and attained a speed of over 10 knots, the H.P. developed being 455; revolutions, 155; vacuum, 27½ in. After the trial the vessel was moored in Middlesbrough Dock to load with

general cargo for Monte Video, and will be taken out under the command of Captain Jones, who has also superintended the building of the vessel, which is classed with the Bureau Veritas Society.

**Foyle.**—On April 10th this vessel, which was launched by Messrs. W. Doxford and Sons, of Sunderland, on March 16th, took her trial trip in exceptionally rough weather, when everything went off without a hitch and the vessel sailed for Middlesbro', from whence she sailed on the 13th inst. for Antwerp. She has been built to the order of the Mercantile Steamship Co., of 70 and 71, Bishopsgate Street, London, and during construction has been under the supervision of Mr. Terrot Glover, of Sunderland.

**Neva.**—On April 13th the steamship *Neva*, belonging to Messrs. Stott & Co., a vessel 212 ft. 1 in. length; 29 ft. 6 in. breadth; 16 ft. 3 in. depth of hold, left the Mersey with a full cargo of 1,160 tons for the Baltic. This vessel has during the last few weeks been undergoing extensive alterations to her machinery, it having been converted from the compound two-crank type to triple-expansion, by the substitution of three new cylinders, 15 in., 22 in., and 38 in. diameter respectively, with a stroke of 30 in., a three-throw crank shaft, and large steel boiler 12 ft. 6 in. diameter by 10 ft. long, working at a pressure of 150 lb. per square inch. The engines ran smoothly at 83 revolutions per minute, the vessel attaining a speed of eight knots an hour. The performance of the engines was considered most satisfactory, and the vessel proceeded direct to sea on her voyage. The whole of the foregoing work was carried out by Messrs. D. Rollo & Sons, engineers, of this city, under the direction of the owners' superintendent engineer, Mr. Alex. M'Cracken.

**Emerald.**—On April 13th the new steamer *Emerald* had her trial trip. Notwithstanding there was a heavy sea, the run in all respects was highly satisfactory, she being pronounced by all on board to be a splendid sea-boat. The engines, which are compound surface-condensing, by Mr. J. O. Spence, Limekiln Shore, North Shields, worked without a hitch, the speed of the vessel being all that could be desired under the circumstances. The boilers (multitubular), made of steel, were by Mr. R. J. Marshall, South Shields, and gave an abundant supply of steam, only very small coal being used on the occasion. The vessel is owned by Messrs. John S. Forrest & Partners, to whose order she has been built by Messrs. Maw Brothers, Citadel Works, Leith. She will be employed in the line fishing.

**Lyonnesse.**—On April 16th the s.s. *Lyonnesse*, a steel screw steamer built and engined to Lloyd's and Board of Trade's highest class, by Messrs. Harvey & Co., Limited, of Hayle, Cornwall, for the West Cornwall Steamship Co., Limited, was taken on her official trial. The ship is 170 ft. B.P. long; breadth, 25 ft. 3 in.; depth, 10 ft. 4 in. Her engines are of the triple-expansion type with cylinders 22 in., 32 in., and 52 in. diameter by 30 in. stroke, supplied with steam from two boilers, each 13 ft. 6 in. diameter by 10 ft. long, having three Purvis's furnaces in each, and a working pressure of 150 lb. per square in. The ship is intended for traffic between Penzance and the Scilly Islands, and is fitted up with handsome cabins for passenger accommodation. Her cargo will consist principally of fish, flowers, and vegetables, and she will also carry the mails. After a preliminary run of several hours, she was taken four times over the measured mile, which was accomplished at the rate of over 12½ knots per hour. The engines ran very smoothly at 96 revolutions per minute, and there was an entire absence of heated bearings.

**Magnus Mail.**—On April 17th the screw steamer *Magnus Mail*, one of Mr. James Westoll's fleet of 31 boats, from Messrs. Short's yard, had her trial trip. A number of the managing owners, partners, and their friends were on board. Over the measured mile the pace was found to be at the rate of 10 knots an hour. Under Captain Mail's command the steamer at once went to her work, and began the task of carrying 3,000 tons of coal to Savona.

**Maltby.**—On April 17th the new steel steamer *Maltby*, just completed by Messrs. Ropner & Son, Stockton-on-Tees, had her trial trip from the Tees. After taking in bunker coal at Connal's Wharf, she steamed down the river into the bay, where her compasses were adjusted, after which a long run was made, when everything was found to work satisfactorily, a speed of over 18 knots being attained. This steamer forms one of Messrs.

R. Ropner & Co.'s fleet. She has been built under the supervision of Captain Rooke, their marine superintendent, and will carry over 4,350 tons deadweight. Her engines and boilers are by Messrs Blair & Co., Limited. The steamer afterwards proceeded to Cardiff, where she will load for Genoa.

**Pocahontas.**—On April 18th the steamship *Pocahontas*, built and engined by Messrs. Robert Stephenson & Co., Limited, of Newcastle, was taken on her trial trip. Her principal dimensions are:—800 ft. between perpendiculars, 89 ft. breadth, and 27 ft. 6 in. depth, moulded, with a carrying capacity of 3,750 tons. She has been built for the Mediterranean and New York Steamship Co, for whom Messrs. Phelps Bros., of Liverpool, are managers, and is intended for the Mediterranean and New York trade. She is fitted with triple-expansion engines of the latest type, having cylinders 25 in., 39 in. and 62 in. diameter, with a stroke of 42 in., and supplied with steam power from two extra large steel boilers, working at a pressure of 156 lb. per square inch. Four runs were made on the measured mile, when a mean speed of 12½ knots was attained. The engines worked without a hitch, and the owners' representatives on board expressed themselves highly satisfied with the ship's performance throughout.

**Siggen.**—On April 20th the steamship *Siggen*, built by Messrs. John Blumer & Co., North Dock, Sunderland, was taken on her trial trip. Her principal dimensions are:—Length between perpendiculars, 290 ft.; breadth, 38 ft.; depth, moulded, 22 ft. 4½ in. Her carrying capacity is 3,600 tons. She has been built to the order of Messrs. Harlof & Bøe, Bergen, and is fitted with all the latest improvements. Her engines were built by the North-Eastern Marine Engineering Co., Sunderland, and are of the triple-expansion type, with cylinders 21½ in., 36 in. and 59 in., and a stroke of 39 in. The boilers are of steel, working at a pressure of 160 lb. per square inch. A series of runs were made over the measured mile, and a mean speed of 10½ knots was attained. The ship and engines gave every satisfaction to the owners.

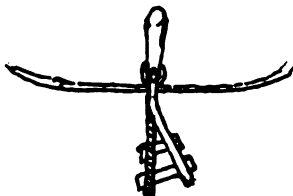
## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

### A BREAKDOWN.

To the Editor of THE MARINE ENGINEER.

SIR,—I send you the particulars of the repairs of a breakdown to a rudder of a small steamer plying on the river Hooghly as a tug, and in coasting. She was (on the trip in which it occurred) going up the Burrabalong river to Balasore, and as the river is very shallow and tortuous she got on a sand-bank, and in backing off during the night tide, run stern into



the river bank, and bent her rudder straight up and down to an angle of about 80 deg., so that when the helm was "hard over" to port, the rudder was fairly amidship; the pintle at the bottom was broken clean off, so was also the top gudgeon pin below the braces. The damage done was so apparent that it was suggested from all sides to stop at Balasore and get a new rudder from Calcutta, or order a tug to tow her there. The chief engineer in charge, Mr. A. Talbot, very ingeniously fixed on the old rudder a second one of wood, making the whole a sort of double-bladed rudder so to say. The accompanying rough plan will, perhaps, better explain my meaning. The main piece being of wood bolted on to the old rudder with

bolts made on the spot on board from old stay tube rods, and the ferules or distant pieces being cut from old boiler tubes. I may mention here that from the vessel's inability to steer after getting off the bank, she got on another sand heap, and was left "high and dry" at low water, this enabled the engineer to carry out this ingenious arrangement and saved the company the expense of having the steamer towed up to Calcutta, a distance of some 200 miles.

I send you the above, feeling sure that your readers will consider it of interest, as a piece of work carried out on emergency by one of their body. The work occupied in all seventeen hours, and was only come-at-able at low water.

Yours faithfully,  
W. D. C.

Calcutta, 18th February, 1889.

## WASTING AWAY OF PROPELLER BLADES.

To the Editor of the MARINE ENGINEER.

DEAR SIR,—Being an old subscriber, and never having troubled you before, perhaps you would kindly insert the following, and if any brother engineer will kindly furnish the required information, he would confer a great boon on many beside the present writer:—

1st. What is the cause of screw-propeller blades wasting away on the forward part of the leading corner?

2nd. Is it true—as I have heard it asserted—that they do not waste while running along the North American Coast?

3rd. Is it true they do not waste while running in fresh water? If so, why?

4th. What is considered the best preventive to apply for the wasting of steel blades?

I remain, Sir,  
Yours faithfully,  
J. J. E.

Jamaica, W.I.  
25th March, 1889.

## Miscellaneous.

### CONCERNING A RECENT ENGINEERING FEAT.

The Very First Lord of the Admiralty is interviewed by MR. PUNCH.

MR. PUNCH (bowing politely). Perhaps, my Lord, you could give me a little information. I hear that your Engineer-in-Chief, Mr. Richard Sennett, has sent in his resignation, having joined the well-known firm of Maudslay, Sons & Field. Is this the case?

The Very First Lord (pleasantly). Yes, Mr. Punch; you have been correctly informed. It is, you see, it is the humorous custom of this Department to undervalue the services of first-class scientific experts, and to offer them, accordingly, inadequate remuneration. As Mr. Richard Sennett was, when in our service, at the head of the largest steam navy in the world, we naturally endeavoured to cut down his salary to as low a figure as possible, and fixed it, therefore, at £1,000 a year. As any engineering firm in the kingdom will pay a far handsomer stipend than this, even to the head of a single department, he, oddly enough, perhaps being deficient in a sense of humour, on the first opportunity presenting itself, actually threw up the post and left us.

MR. PUNCH. Quite so. But do you find so economical—ahem!—a system of doing business answer?

The Very First Lord (considering). Well—um—perhaps not. In fact rather the contrary; for we cannot command the services even of our own able men. Indeed, all the leading posts in high-class engineering firms are, of course, it is satisfactory to know, at the present moment, filled by scientific experts who have taken honours at the Royal Naval College itself.

MR. PUNCH (severely). Certainly, that is very satisfactory. Some people would consider the information rather startling. May I ask, my Lord, what you intend to do?

The Very First Lord (jovially). Well, to be quite frank with you, Mr. Punch, I don't know what our intentions may be, but I can confidently tell you what we shall do, and that will be—just nothing! (left smiling amiably as interview terminates.)—Punch.

MR. RICHARD SENNETT, who has served the office of Engineer-in-Chief of the Navy since the retirement of Sir James Wright

Duncan as a partner in the engineering firm of Messrs. Maudslay, in 1886, has sent in his resignation, and will leave the Admiralty at the end of May. Mr. Sennett will succeed the Hon. George Sons & Field, of Lambeth. There is something radically wrong in the system which leaves so great a discrepancy between remuneration and official responsibility in the engineering branch of the Navy that the most competent men are constantly abandoning the service of the country to accept more lucrative positions in private establishments. At the present time the engineering branches of such firms as Hawthorne & Co., Newcastle, Harland & Wolff, Belfast, and the Shipbuilding Co., Hull, are either wholly or in part conducted by men who took honours at the Royal Naval College. The pay of the Engineer-in-Chief of the Navy amounts to £1,000 a year, with an addition of £200 after five years' service, and for this small remuneration, which is considerably less than a private company is accustomed to give for the superintendence of a single establishment, he is expected to take complete charge of the steam department of the greatest steam Navy in the world.

**SHIP LIGHTING.**—Messrs. W. H. Allen & Co., of York Street Works, Lambeth, have just completed the lighting of a large passenger vessel, built by Messrs. Laird Brothers, Birkenhead, for Compania Sud Americana de Vapores. The vessel, named the *Imperial*, is one of 2,000 tons burthen, propelled by engines of 4,000 H.P., and is specially built for the trade between Valparaiso and Callao. The boat is fitted with the most modern appliances, and the saloon is lined with maple and satinwood, beautifully ornamented with carvings, and luxuriously upholstered. The electric light has been provided for every part of the ship, from the masthead to the coal bunkers, and employs over 230 glow-lamps of the Edison-Swan type. The signal lights are considerably stronger than can be provided by the best oil lamps, and are so fitted that oil can be substituted, if needful, at a moment's notice. Special brackets are supplied for loading purposes. In the engine-room, bunkers, and holds plugs have been inserted so that the current may be tapped, and a powerful light concentrated in any given spot for temporary purposes. The elegant electroliers for the saloon and social hall have been designed to suit the fittings and furniture, and are adapted both for oil and electricity. The lamps exposed to rough usage are enclosed by damp-proof bell glasses, and these are protected by strong wire cages. Cockburn's slate switches and fuse boxes have been plentifully used throughout, each state-room being separately connected. The conductors branch into six circuits from a six-way slate switch board, and a second board with the main fuses and fitted with a voltmeter is placed on the return circuit. All the wires are enclosed in wood castings. The Kapp dynamo is compound wound, and capable of feeding the whole of the lamps at the low speed of 300 revolutions per minute. It is driven direct by an Allen twin-engine at a steam pressure of 160 lb. The engine and dynamo are so fitted as to work without vibration, and no sparks are visible at the brushes. The installation has been superintended throughout by Messrs. Allen's electrician, Mr. J. W. Kempster, and gave universal satisfaction on the trial.

**CITY OF NEW YORK.**—The new Inman and International steamer, *City of Paris*, promises to be a great success. It is stated that she made the run from Liverpool to Queenstown in 11 hours 50 minutes, or at the rate of 20·8 knots the whole way. The actual time over was 6 days 19 hours. She encountered strong north-west gales the first three days out.

**THE CONGO TRADE.**—A French steamer named *La France*, belonging to the firm of Dumas, Beraud & Co., has been launched at Stanley Pool. This is the sixth trading steamer plying on the upper Congo. Four belong to a Belgian company, and the fifth to a Dutch one. The *La France* is to run regularly between Stanley Pool and a French factory which has quite recently been established at the confluence of the Ubangi.

The Admiralty have granted an important concession to the young engineers of the Navy by shortening the period of service of assistant engineers, before promotion, by a year. The alteration is to be carried into effect by allowing the time passed at the Royal Naval College, Greenwich, to count.

The *Nile*, double-turret ship, which was built at Pembroke and brought round to Portsmouth to complete, has been floated out of dry dock, notwithstanding the fact that her turret armour was deposited alongside the dock in readiness to be lifted on board. Possibly the dock may be temporarily wanted for some other vessel, or the dockyard authorities may have

other reasons for getting her afloat in the repairing basin. It is, however, stated that there was a danger of her subsiding had she remained much longer resting on her keel, the structure being too weak, either through the effects of corrosion while at Pembroke or original defects, to enable the hull to support the immense weight of the armour. The belt varies in thickness from 20 in. to 14 in., and the side armour from 18 in. to 16 in., while the bulkheads which protect the turret basis have a thickness of 18 in., and the other bulkheads a thickness tapering from 16 in. to 7 in. The total weight of the protection to be carried, exclusive of glacis plates and the steel decks, amounts to 4,230 tons. Before the vessel was taken out of dock the butts along the upper edges of the skin plating below the waterline and on the quarter which tapers sharply to accommodate the screw shafts had opened to the extent in places of half-an-inch and an inch, and it is believed that the hull will have to be strengthened before additional weights can be placed on board.

**A FIVE-MASTED SAILING SHIP.**—The preference of shipowners for large cargo-carrying vessels is becoming more and more pronounced, and the companies more particularly engaged in the part of the shipping trade in which sailing ships are worked seem to vie with each other in securing "the largest ship afloat." Intimation is made this week that a contract has been placed, on behalf of Messrs. Ant. Dom. Bordes & Son, Paris and Bordeaux, with a firm on the Clyde, who make the building of sailing ships a speciality, for the construction of a five-masted steel sailing ship to carry 6,000 tons deadweight. Not only will this be the first five-master, but it will be the largest sailing ship afloat. At present a vessel built by Messrs. Russell & Co., Greenock and Port Glasgow, and named *Liverpool*, has this distinction. She has a gross tonnage of 3,380 tons, her length being 338 ft.; breadth, 47·9 ft.; and depth, 28 ft., moulded. Brokers, too, like the big ship, and the reason is so evident that it is not necessary to refer to it; but underwriters do not seem so much enamoured with it. Quite recently one of the largest vessels—shorter by 10 ft., but broader by 1½ ft. than the *Liverpool*—was chartered to take coal; but when all the debatable points of a charter were settled the underwriters had to be reckoned on, and they desired such a premium as made it quite impossible to proceed further in the matter—something like £10 to £15 per £100. They contended that the greater the quantity of coal carried the greater the danger of fire. This vessel, however, has made several voyages, and no difficulty is now being experienced with the insurance firms. They will be educated to a higher standard, although at present a little conservative. There is another difficulty, however, which cannot be so readily overcome. Such large vessels can only be employed profitably in certain trades, and great inconvenience must arise unless suitable graving dock accommodation can be afforded at the large trading ports. No difficulty will be experienced at home, but in Calcutta, for instance, one of the big ships now afloat presented itself recently for admittance to the dock, and it was found that her beam was too great; and yet boats with more beam will be built. The result was that she had to load and hope for better accommodation at her next port. San Francisco and New York have large docks, but the importance of Calcutta ports for ships cannot be ignored.—*Engineering*.

**RAPID MARINE WORK.**—As indicating the speed with which work is being executed at Messrs. J. Richardson & Son's Marine Engine Works, Hartlepool, we may notice the following:—The s.s. *Khio* was launched from the shipbuilding yard of Messrs. E. Withy & Co. on Friday, April 5th, at 5 p.m., and went into the Victoria Dock that evening to receive her engines. She was taken in hand by Messrs. Richardson's staff, and although no work was done on Saturday afternoon nor on Sunday, her machinery was tested under steam to the satisfaction of Lloyd's inspector on Thursday, at 11 a.m. The total time occupied was thus only 3½ days, a remarkable result, considering the size of the engines, and one which speaks well of the facilities for despatch at Messrs. Richardson's works. The *Khio* is fitted with triple-expansion engines on three cranks, the cylinders being 22 in., 37 in. and 61 in. diam. respectively, with a stroke of 3 ft. 3 in. She has two large boilers, designed to work at 160 lb. per square inch. A further instance of quick despatch is that of a double-throw built steel crank-shaft for the s.s. *Lemuria*, of 150 H.P. nominal. The order for this shaft was received on a Saturday morning, and although no work was done on Saturday afternoon nor on Sunday, the shaft was forged from the ingot, finished complete with keyways, cut and sent off on Thursday forenoon.

## BOARD OF TRADE EXAMINATIONS.

NOTE.—1 C, denotes First Class; 2 C, Second Class.

March 23rd, 1889.

Bartlett, Wm. C. 1C Cardiff  
 Bond, Edward. 1C Liverpool  
 Brockbank, J... 1C "  
 Brown, Alex. A. 2C London  
 Brown, Wm. J. 1C "  
 Cameron, John 1C Cardiff  
 Clark, Matthew 2C Glasgow  
 Clarke, Arndt. T. 1C Liverpool  
 Coe, John B... 2C Cardiff  
 Cowdell, Hy J. 1C London  
 Crosby, John T. 2C Bristol  
 Cumming, David 2C Cardiff  
 Dey, James R. 2C Aberdeen  
 Donaldson, T.D. 2C London  
 Dunlop, Dvd. A. 2C Glasgow  
 Emans, Wm... 1C Liverpool  
 Ferens, Frank S. 1C N.Shields  
 Finlay, D. J... 1C London  
 Gay, Alex... 2C S'tha'p'tn  
 Heckels, Richd. 1C N.Shields  
 Hodgson, John 1C W.H'tl'pl  
 Hughes, Thos... 2C Glasgow  
 Hutchinson, D. 2C Liverpool  
 Irving, John J. 2C "  
 Jones, Fred. W. 2C Cardiff  
 Josh, Alex. B... 2C Liverpool  
 Kennedy, John. 1C Glasgow  
 Kerr, John... 2C "  
 Kyle, N. M. W. 1C N.Shields  
 Lawson, Wm... 2C Glasgow  
 Lee, David S... 2C Liverpool  
 LeMarquand, H.P. 1C London  
 M'Arde, Patr'k 2C Liverpool  
 McConochie, J. 2C Cardiff  
 McNair, John B. 2C Glasgow  
 Miller, Thomas 1C N.Shields  
 Mossman, C. H. 2C Liverpool  
 Murray, Th. N. 1C Glasgow  
 Neish, Thos... 2C "  
 Nielsen, C. F. V. 2C W.H'tl'pl  
 Pottie, David... 2C Glasgow  
 Rowe, Thomas 2C Cardiff  
 Rowe, William 1C Liverpool  
 Ruthley, A. K. 1C Aberdeen  
 Sherriff, Rbt. R. 2C Glasgow  
 Shuttleworth, H. 1C Cardiff  
 Smith, J. Brown 1C London  
 Sykes, Jas. C... 1C N.Shields  
 Tate, Anthony. 1C "  
 Thomas Philip. 1C Sthmpt'n  
 Walker, Francis 1C Aberdeen  
 Wallace, W. H. 1C W.H'tl'pl  
 Williams, G. A. 1C Cardiff  
 Wimshurst, H.C. 1C London

March 30th, 1889.  
 Alexander, Rbt. 1C Hull  
 Armstrong, R.W. 1C Sund'rld.  
 Atkinson, Rbt. 1C Sund'rld.  
 Brown, Syd. C. 2C London  
 Crosby, Harrison 1C Sund'rld.  
 Drary, Wm. E.K. 1C Hull  
 Farrell, Rbt... 1C Sund'rld.  
 Fenwick, Thos. 2C N.Shields  
 Hall, Tom Henry 2C "  
 Harrison, Jos. B. 1C "  
 Hooke, Wm. G. 2C London  
 Jarrett, Wm. G. 2C "  
 Kitson, Wm... 2C "  
 Lambert, Jno... 1C Sund'rld.  
 Lang, Wm... 1C N.Shields  
 McCulloch, D... 2C London  
 M'Queen, Rbt. 1C Liverpool  
 Miller, John W. 2C "  
 Milne, Jas. S... 2C London  
 Wm. H. 1C "

Neasham, Jno. M. 1C Sund'rld.  
 Petrie, Jas. Alex. 1C "  
 Punnett, H. Wm. 2C London  
 Ramsay, T. H. 1C Sund'rld.  
 Rowe, Wm... 1C Liverpool  
 Smith, Wm... 2C Sund'rld.  
 Suverkrop, Ed. 2C London  
 Taylor, E. J... 2C "  
 Tosh, A. B... 2C Liverpool  
 Tremain, Wm. 2C Hull  
 Walters, Rbt. 1C Liverpool  
 Wilkinson, J.W. 1C Sund'rld.  
 Willis, Rbt. H. 1C Liverpool  
 Wilson, John A. 2C "  
 Wymer, D. W. 2C London

April 6th, 1889.

Adams, Chas. E. 1C Liverpool  
 Baselow, Herm. 2C N.Shields  
 Bavaire, D. W. 1C Glasgow  
 Belford, David 1C N.Shields  
 Bellwood, T. S. 2C "  
 Boxall, George 1C Cardiff  
 Burnett, John... 2C N.Shields  
 Campbell, Hect. 2C Glasgow  
 Charters, Alexr. 1C Liverpool  
 Chisholm, Geo. 1C "  
 Cruickshank, W. 2C Glasgow  
 Dunbar, Alex... 1C Liverpool  
 Fyale, James E. 1C "  
 Gillespie, Andw. 2C Glasgow  
 Goodall, John... 2C "  
 Hayes, Wm. Jas. 1C Belfast  
 Hough, Henry... 1C Liverpool  
 Huntress, John 1C N.Shields  
 Kendall, Chas. E. 1C Cardiff  
 Lang, Wm. V. 1C "  
 Lessels, Thos... 1C Leith  
 Marshall, John 1C Glasgow  
 Muir, Peter... 2C "  
 Scott, James... 2C "  
 Stark, James... 2C "  
 Starkey, Henry 2C London  
 Stewart, Louis 2C Glasgow  
 Stringer, Alfred 2C Cardiff  
 Thomas, John... 2C "  
 Thompson, Ldy. 1C "  
 Walker, John F. 2C Glasgow  
 Watson, Fred S. 2C Leith  
 Whelan, James 2C Cardiff  
 Wright, Rbt. G. 2C N.Shields

April 18th, 1889.

Campbell, Ax. 1C Greenock  
 Cole, Percy A. 2C London  
 Dennis, Rd. H. 1C Liverpool  
 Duncan, John... 1C N.Shields  
 Elliott, Edn. F. 2C London  
 Fallows, John... 1C Liverpool  
 Geach, Ern. E. 2C Cardiff  
 Hands, John... 1C Liverpool  
 Harding, W. R. 2C N.Shields  
 Harley, Rbt... 2C Greenock  
 Hunter, John... 1C N.Shields  
 Jones, Arthur P. 2C Cardiff  
 Lewis, Wal. T. 1C "  
 Lyall, John... 1C Liverpool  
 McClement, R.J. 1C Greenock  
 Molyneux, Albt. 1C Liverpool  
 Pearson, C. O. 1C N.Shields  
 Robson, Alfred 2C "  
 Ross, David... 2C Dublin  
 Sanderson, Wm. 2C N.Shields  
 Shields, John... 2C Liverpool  
 Veassopulos, N. 2C Cardiff  
 Whyte, Mat... 1C Greenock  
 Williams, R. J. 2C Liverpool  
 Williamson, R. 2C N.Shields

Recent applications for Patents connected with  
 Marine Engineering, Ship Construction, and  
 Mechanical Appliances for use in Ships, from  
 March 16th to April 18th, 1889.

4664 J. Millwaters. Propelling ships by water.  
 4695 W. Heelop. Construction of boats.  
 4702 J. Bower. Detaching screw propellers from ships.  
 4708 F. Nicholson & E. Jennings. Poles or masts.  
 4736 Boulton (O. Mentzel). Steam boilers.  
 4739 Allison (J. Townsend). Swivel for flag halyards.  
 4789 J. Okeas. Pumps.  
 4812 R. Earle. Marine distress signal bombs.  
 4837 J. McAnelly. Reducing valves.  
 4873 W. Dyce. Sea anchors.  
 4887 C. Wharton & W. Topham. Breech-loading cannon.  
 4888 E. E. de Facien. Screw propellers.  
 4911 J. Martin. Heads of ships.  
 4923 Sir W. Thompson. Compass cards.  
 4967 P. G. S. Canavesio & M. Cosovich. Propelling vessels.  
 5005 W. Pover. Boiler tube stoppers.  
 5017 W. H. Harfield. Anchors.  
 5018 Ditto. Steam steering gear.  
 5034 W. Busing. Ships.  
 5070 C. Wells. Motor.  
 5071 J. Simpson & A. Durkie. Securing tarpaulins to ships' hatches.  
 5098 J. Lea & E. H. Wynne. Cleaning waterways.  
 5100 W. R. Cummins. Valve gear.  
 5178 J. Samuels & C. H. Evans. Protecting vessels.  
 5197 Mewburn (La Société des Générateurs à Vaporisation Instantanée Systeme Serpollet). Generating steam.  
 5240 O. Phalp. Packing for high pressure engine glands.  
 5244 S. D. Gibson. Anchors.  
 5265 G. F. Ekeland. Low-pressure steam trap apparatus.  
 5277 M. Vogelgesang & J. H. Bonn. Screw propellers.  
 5305 W. R. B. Chamberlin. Shipbuilding.  
 5336 J. Verity. Preventing corrosion of propeller blades.  
 5339 V. B. Lewes. Purifying sea water.  
 5415 E. Reddies. Propelling steamships.  
 5416 G. F. Calderwood. Interlocking fire bars.  
 5433 J. Zanni. Propulsion of vessels and boats.  
 5484 R. Marshall & E. Fitzgerald. Stuffing boxes.  
 5494 F. S. Snowdon. Actuating controlling valves of engines.  
 5495 R. R. Little, J. Hall & T. Archer, Junr., Signalling on steamships.  
 5535 W. Blair. Propulsion of vessels.  
 5626 F. Howchin. Producing steam for driving engines.  
 5645 R. Harnett. Applying stay-sails to vessels.  
 5681 S. R. Lane. Propelling ships, boats, &c.  
 5769 H. N. Morgan. Torpedo.  
 5791 M. van Look. Composition for removing boiler incrustation.  
 5828 J. Hewitt. Automatic cut-off valve.  
 5863 B. Tower. Maintaining a constant plane in a floating vessel.  
 5879 L. Hopcroft. Self-stoking furnace.  
 5918 T. Sandford, A. Diggle & M. Mitchell. Steam boiler water gauges.  
 5936 S. Pemberton. Life belt.  
 5996 O. Phalp. Ships' davits.  
 5997 Ditto. Water-tight covers for ships, boats, &c.  
 6056 W. H. Northcott. Cylinders for marine engines.  
 6080 T. Parensen. Propulsion of ships.  
 6086 Boulton (F. X. Komarek). Valve gear.  
 6096 B. Tower. Keeping platforms or cabins steady on ship-board.  
 6097 Bradbury (Grimme, Natalis & Co., Limited.) Purifying boiler feed water.  
 6137 D. McGregor, Junr. Recording log.  
 6270 O. Phalp. Securing propellers to their shafts.  
 6271 Ditto. Ships' boat-hook.  
 6281 A. Brown. Steam ferry boats.  
 6296 D. Bánki & J. Csonka. Valve motion.  
 6330 N. Miller. Row-locks for boats.  
 6338 E. H. Storey. Indicating depth of water.

## The Marine Engineer.

LONDON, JUNE 1, 1889.

THE duel between naval architects for the protection of vessels, and the artillerists for their destruction, still continues to be waged with unabated ardour on either side. In an interesting paper, communicated by Sir Nathaniel Barnaby to the Institution of Naval Architects, we find pointed out in a comprehensive manner how this duel has waged with alternate success to either party, during the last thirty years, as exemplified by the French navy. The first phase of protective armour was uniformly spread over the ship's side to protect it against the destructive effect of shells exploding in board. The artillerists then devoted attention to heavy guns with extreme piercing qualities, until there was nothing under 22 in. of armour that would serve to resist their impact. This naturally led, by the extreme thickness required, to the diminution of the area which could be protected by such armour. The artillerists have now returned successfully to the introduction of lighter, but still powerful quick-firing guns, discharging shells with high explosives capable of fearful execution in board. The naval architects have thus been forced to a partial return to the all-over armour protection, to attempt to keep out such dangerous explosives, but with a result which can hardly be accepted as satisfactory, since the armour lately adopted by the French navy for this purpose only averages 4 in. in thickness, and is thus no protection against a 5-in. shell gun, as at 1,000 yards this gun is capable of penetrating 5 in. of steel armour. Sir Nathaniel Barnaby has been giving this serious question his best attention, and submits a design of a vessel which shall have the same speed as the larger Admiralty design, namely, two knots more than the largest French ships, and to be capable of perforating more than 99 per cent. of the area of the sides of all armoured foreign ships, and to be comparatively cheap in construction. The English Government, on the other hand, are approving a design for the increase of displacement to 14,000 tons, giving also the desired protection of buoyancy and stability to the vessel and protection from quick-firing shell guns. This increase of size and protection is likely to add to the cost of the ironclads to the extent of about a quarter-of-a-million of money for each ship, which item of increase appears to be

sufficient to build an additional vessel of the type proposed by Sir Nathaniel Barnaby. The armour, however, of such suggested new design is only 6 in. in thickness, which is no protection against the present heavy guns, though it may serve to amply protect against shell fire. With regard to the Government vessel, now to be raised to a 14,000-ton ship, it may be said to be putting an undue number of eggs into a single basket, as even a ship of that dimensions may be liable at any time to sudden destruction by ramming, or even from a successful torpedo attack. There appear to be still so many necessary weaknesses in defence in such ironclads, that it may be considered better policy to distribute our chances over smaller and even weaker vessels than those of 14,000 tons. The guns proposed for the comparatively small vessels of 3,200 tons by Sir Nathaniel Barnaby are to be capable of piercing 18½ in. of steel armour at 1,000 yards, and they are to be provided in action with two 6-pounder quick-firing guns, which would be mounted between the heavy guns under cover of the armour. Both foreign and the British Navies seem with the new guns to be subject to fearful risks in action. Probably 10,000 men will be sent to sea in about 50 ships, in many of which there are boilers and magazines accessible to the lightest quick-firing gun, and there is nothing to prevent the projectile from traversing the ship and driving out the bottom plate under water on the further side of the ship. It will not, in the opinion of experts, need many minutes to put an end to an action between such antagonists, and with regard to the French navy it may be summed up that three-fourths of that navy has no efficient protection of buoyancy or stability by means of side armour. The concentration of expenditure upon monstrous vessels so heavily armoured, as is the latest suggested design from the Admiralty, will only provide protection for ships' companies of 500 men each. Should war seriously occur, we should probably be obliged to obtain, as and where we could, another duplicate Navy to bring our Navy fighting line equal to the accommodation of former days; that is, to accommodate another 50,000 men. All these additional ships, obtained in emergency, would thus have to be unarmoured vessels, and with any chance guns that could be obtained. This seems a serious argument against the expenditure of the late voted additional estimates to the Navy in the mere increase of tonnage, and concentration of armour in a few ships instead of looking to the largest possible increase in the number

of our fighting ironclad vessels of smaller tonnage, so long as these latter may seem to be practicable fighting ships. Sir Nathaniel Barnaby, who insists upon the method of construction of unarmoured ends acting as floats to the central citadel being right in principle, and to retain the greatest buoyancy in such unarmoured ends, advocates strongly the packing of such portions with a material which shall not absorb water, and whose buoyancy shall not be injured by perforation or direct contact with the liquid. There has been considerable difficulty in obtaining such a material, that of the Woodite Company being suitable as to its properties, but frightfully expensive. Henow states, however, that a material has been produced at so low a weight as 10 lb. to the cubic foot, non-absorbent of water, and cheap. About four to five per cent. of the displacement should be occupied by this material packed solidly in various compartments. It is, in his design, 18 in. deep in the shallowest place, and 6 ft. deep at the sides where the stability wings are formed. These wings are enclosed in thin steel cases and extend two-thirds of the length of the ship. The cost of the packing is in this case £6,000 for the ship. The material is doubtless susceptible of improvement, but it appears already admirably suitable, for the purpose. The material has the advantage which side armour has not, that it is applicable to all fighting ships large and small. A solid raft is thus formed upon and above a deck, covering the machinery and magazines, and occupying the water zone, and this is what Sir Nathaniel Barnaby thinks is wanted in every fighting ship. This will allow the designer to devote some armour to protect the batteries against the attack of the high explosive shell and the quick-firing gun—the present defencelessness is no longer tolerable. It is a protection against foundering, and will enable the construction of comparatively light and cheap fighting vessels to be effected in considerable numbers, and in the numbers of the crews that can be put afloat.

As the safety in a modern ironclad in storm or battle may actually depend upon the excellence of design and construction of its engines and boilers, it is of the utmost importance that the dimensions and designs authorised and specified by the Admiralty, should be of the most reliable and most efficient character. The best vouchers for the accuracy of the Admiralty scantlings is, from time to time, to carry out experimental tests upon the actual structures

themselves. We are interested, therefore, in the account of experiments in endeavouring to burst a boiler shell, made to Admiralty scantlings, read by John Scott, Esq., before the Institution of Naval Architects. The boiler shell in question was a duplicate of new steel boilers which were being made at the Greenwich Foundry for Her Majesty's gun vessels *Sparrow* and *Thrush*, intended for a working pressure by Admiralty specification of 145 lb. per square in. The mean diameter of the shells was 7 ft. 8 3-16 in., and the thickness of shell plates 19-32nds of an inch, and the total length of the experimental boiler was 11 ft. The workmanship was of the usual character, the flanged ends were pressed by the Leeds Forge Co's hydraulic press, and were not annealed. The shell plates were bent cold, rivet holes were bored in place after bending. The rivetting of the shell plates on the one end was done by hydraulic machines, the closing end being rivetted by hand. Pressure was gradually raised and dimensions for alteration of form were taken at intervals. At the desired working pressure of 145 lb. per square in., a slight alteration of form was registered, probably arising from the effort of the boiler to assume a true cylindrical shape. At 235 lb. pressure per square in. the various alterations in form had taken place up to maximum deflection of 1-8 of an inch. The pressure was then continued up to 300 lb. per square in., and on pressure being reduced to zero, the boiler returned to its original figure; up to this time no leakage had occurred. Pumping was again continued up to 450 lb., when the leakage from the manhole permitted the water supply by the pumps to escape, and the pressure thus had to be suspended. A permanent set had now been assumed, and as the manhole strengthening plate was leaking and showing signs of weakness, it was removed and a large plate was placed around the manhole opening and secured by rivets spread over its surface. On a resumption of the trial, pressure was continued to 520 lb. per square in., when once more the leakage absorbed the supply of the pumps—the leakage, however, being limited to the manhole and to the ends of the butt straps. At a further trial the pressure reached 600 lb. per square in., at which leakage absorbed the whole water supply, and throughout the whole of these trials the rivetting showed no signs of leaking, and no difference was to be detected between hand and machine rivetting. It would appear, then, that in steel boilers there will always be a tendency for leakages to set up, providing an escape of pressure

before actual bursting pressure is arrived at. The permanent set of the boiler ends was also somewhat noticeable, inasmuch that they assumed a fairly regular curve from the circumference to the centre. This must have been permitted by the considerable stretching of the longitudinal bolts. By this experiment mild steel has certainly justified itself as a most reliable and satisfactory material, and the homogeneous strength throughout the structure amply verifies the general opinion that Admiralty scantlings are considerably on the right side of safety.

The last fearful disaster off the coast of Samoa, in which several German gunboats and United States cruisers were disastrously wrecked upon the rocky coast to leeward under the pressure of a violent hurricane, whilst the British cruiser, the *Calliope*, alone of all the war vessels in the bay, escaped, most emphatically points to an opinion we have often stated that modern steamers and the Navy depend for their very existence upon the quality and successful care and handling by the engineers, of the machinery with which she is supplied, and yet it is hard for the engineers to achieve to a recognition of their position as on an equality with the sister branch of the Service. The history of the escape of the *Calliope* is nothing more nor less than a triumph of the engineers who built her boilers and engines, and of the naval engineers in charge of her at such a critical moment, though one would not wish to detract from the pluck and determination of her gallant captain to essay such an effort of steaming out of the bay in the face of such a hurricane. It must, however, not be overlooked, that all the pluck and determination in the world on the part of the captain, to attempt such a feat, would have been absolutely useless, but for the capability and reliability of the boilers and engines, under the engineers' supervision, to have effected the triumph. Thus in every sudden emergency of tempest, or of pursuit of, or escape from enemies in battle, or of successful ramming exploits, it will still be always the engineers and the machinery under their charge upon whom the result will depend. What with practical tests of boilers and engines such as that we have referred to above as carried out at the Greenock Foundry, and with such critical tests as that to which the *Calliope* has been exposed, we need have little doubt that, in comparison with any opposing navies, we shall once again score

successes as heretofore, not now dependent only upon the bull dog courage of the British seaman, but also upon the perfect workmanship and design of engines and boilers and other mechanical appliances, without which the modern ironclad would be but a helpless coffin on the waters.

THE proposition as to how the protection of our Mercantile Marine in the case of war may be effected, is still to a great extent a matter of suggestion and debate. The only point upon which there seems to be unanimous opinion is, that the number of war cruisers that we do at present, or shall in the next few years, possess, is nothing like adequate protection to our merchant ships. Captain C. C. P. Fitzgerald comes to our aid in this dilemma by proposing how this protection may be secured at very moderate costs, and by the most simple means, which he explains in a paper read before the Institution of Naval Architects. He does not consider that the 40 or 50 first-class steamers on the Admiralty list will be prepared to act as regular men-of-war cruisers, but considers that it will be required to keep up the supply of food and raw material for manufactures, and that it will thus take all their time and attention to defend themselves without attempting to protect their neighbours. Captain Fitzgerald starts the following somewhat novel theory, that any merchant steamer would be extremely difficult to catch or disable were she to persistently fly from a cruiser, keeping her stern always presented to the pursuer. If a transverse bulkhead containing fuel were erected to the rear of the engine-room, it could be readily rendered shot-proof to a pursuing cruiser carrying guns of ordinary calibre. He points out that under these circumstances the bow of the pursuer would offer a larger available area of vital danger to the cruiser than would the stern of the longer merchant ship, since the pitch of the cruiser, which may be generally assumed to be shorter than the merchant vessel, and the high speed of a heavy cruiser would cause a large and varying area of the bows to be under water from time to time. He also points out what appears to be a pregnant fact, that in the case of the destruction created in the enemy's commercial marine, the *Alabama* found herself able only to catch sailing vessels, whereas he points out, that in steam vessels it is so easy for them, even when overtaken, to always keep their stern presented to their pursuer,

and that thus it would prove feasible for a merchant steamer to prevent its being readily boarded, or to allow itself to be exposed to broadside engagement. To carry out this *Parthian* mode of combat the merchant cruisers should be provided with one or two guns aft, sufficient to keep up the running combat, and with a fair chance of disabling her pursuer by water-line shots in her bows. As few of the fast cruisers are armoured in their bows, there is every chance of lucky shots, into which the water would pour with great rapidity through the fore compartment of the pursuing cruiser, which would thus probably terminate the pursuit.

## MARINE ENGINE TRIALS.

### RESEARCH COMMITTEE ON MARINE ENGINE TRIALS.—REPORT UPON TRIALS OF THE S.S. *METEOR*.\*

By PROFESSOR ALEXANDER B. W. KENNEDY, F.R.S., *Chairman*.

*Steamer*.—The s.s. *Meteor* is a steamer belonging to the London & Edinburgh Shipping Co., and permission to test her engines was most kindly given to the Committee by Mr. Thomas Aitken, the manager of the company, who, with his staff and all the officials on board the ship, have done their utmost to facilitate the work of the trial. The *Meteor* is a vessel of 261 ft. in length between perpendiculars; 32.1 ft. in breadth; and 19.3 ft. in depth, moulded. Her registered tonnage is 692 and gross tonnage 1,223, under deck 958 tons. Her displacement on the day of the trial, when the mean draught was 15 ft. 1½ in., was 2,090 tons.

*Engines*.—She is fitted with triple-expansion engines, made by Messrs. J. & G. Thomson, of Clydebank, Glasgow. The high-pressure cylinder, originally 29 in. diameter, has been re-bored to 29½ in. diameter, the intermediate cylinder is 44 in. diameter, and the low-pressure 70 in.; the stroke of all three cylinders is 4 ft. The piston rods are all 7 in. diameter; the tail rod of the high-pressure cylinder is 4.45 in. diameter, and the tail rods of the other two cylinders 4.37 in. diameter. These rods have been measured; and the stroke of the engine has also been measured, and found to be exactly 47.94 in., instead of 48. There has been no opportunity of measuring the diameters of the cylinders.

The three cranks are spaced at equal distances apart, and follow in the order—high, intermediate, low.

The cylinders are made with separate liners, and are jacketed at the sides but not at the ends. The net length of the jacketed space is about 4 ft. Live steam is admitted separately to each of the jackets, each having its own reducing valve. The jackets are drained through pockets provided with gauge glasses, and during the trial water was always kept visible in these gauges. The clearances of the high-pressure, intermediate, and low-pressure cylinders are given by the makers as 12.4, 9.3, and 8.02 per cent. respectively.

Each cylinder is provided with a piston valve or valves, single for the high-pressure cylinder, and double for each of the others. The valve gear is the ordinary link-motion, and during the trial the high-pressure motion was linked up as much as possible, giving a nominal cut-off of 26 in.; the intermediate and low-pressure motions were not linked up. The valve gear was left untouched during the whole of the trial. The surface condenser has 3,200 square feet of condensing surface. The screw propeller is four-bladed, having a diameter of 14 ft. 10 in., and a mean pitch of 23 ft. The actual area of the blades is 78 square feet, and the projected area 57.6 square feet.

or read before the Institution of Mechanical Engineers.

The engines had been overhauled last at the annual survey, which took place March 1st to 14th, 1888.

*Boilers*.—The boilers are two in number, each double-ended, the total number of furnaces being twelve. They are of steel with Fox's corrugated flues, and have a diameter of 13 ft. 6 in. and a length of 16 ft. The total grate surface in the trial was 208 square feet, and the total tube surface 5,760 square feet, the ratio between the two being 1 to 27.7. The total heating surface is 6,648 square feet, or 32 times the grate surface. The mean diameter of the flues is 3 ft. 3 in. The firebars are of ordinary description, 3 ft. long, 1 in. broad at top in body, and about 1½ in. at the ends, the air spaces being thus about ½ in. wide. There are 25 bars in the width of each furnace, and therefore 50 bars in each grate. There is no air admission at the bridge or anywhere except from the front and from below the bars. The tubes are 2½ in. external diameter and 6 ft. 4½ in. long. The furnaces and tubes open out into a common combustion chamber. The two boilers have one chimney in common, whose internal diameter is 7 ft. 3 in.; the external diameter of the outer chimney is 8 ft. 3½ in. The chimney has a total height of 61 ft. above the centre of the lowest furnace.

The total weight of the engines and boilers, including water in condenser, pipes, and boilers, and also spare gear, is 390½ tons.

*Object of Trial*.—The object of the trial was to measure the coal, water, and indicated H.P., as accurately as possible, and over as long a period as possible.

*Coal Measurement*.—For weighing the coal, a spring balance was used in each stoke-hole. From the spring balance was suspended a large basket holding about 140 lb. of coal; this being filled was hoisted by tackle, its weight noted, and the coal then thrown upon the stoke-hole floor. About six baskets were filled and emptied as rapidly as possible one after the other, first on the starboard side and then on the port side of the stoke-hole floor, giving thus two weighed heaps of about 800 lb. of coal each. The time at which each heap was finished (that is, completely put on the fires) was noted, and no more coal was weighed out until the floor was clear. A continuous record of coal thrown on the fires was thus kept, which plots out into the line of coal consumption shown upon the diagram, Fig. 1. The fires were not cleaned during the run, but the cleaning commenced when the trial was over, and the ashes and clinkers were weighed before being thrown overboard. The coal was Scotch from the Shawfield pit in the Wishaw district, its price at Leith being 7s. 6d. per ton. It has been analysed and its calorimetric value determined by Mr. C. J. Wilson, F.C.S., of University College, London, with the following results:—

Carbon	..	..	..	70.31	per cent.
Hydrogen	..	..	..	4.88	" "
Water	..	..	..	10.68	" "
Ash	..	..	..	3.46	" "
Nitrogen, sulphur, and oxygen	..	..	..	10.67	" "
					100.00

These figures are the mean of two almost identical analyses. Reducing the hydrogen to the corresponding value of carbon, each pound of coal, not allowing of course for the bad lumps which formed the greater part of the clinker, is thus equivalent to 0.878 lb. of carbon, and its calorific value may be taken as 12,790 thermal units.

*Furnace Gases*.—The temperature of the gases passing up the chimney was observed at intervals throughout the trial, the thermometer used being placed at the level of the upper deck, or about 12 ft. above the top of the boiler. The thermometer was long enough to reach over 2 ft. into the chimney. It was a mercury thermometer having the space above the mercury filled with compressed nitrogen, so as to enable it to give readings far above the ordinary boiling point of mercury.

Samples of the gases from the chimney were collected during the trial, and placed in sealed bottles over mercury. Unfortunately, however, all the samples taken except one were spoilt before they reached the laboratory for analysis. The analysis of this sample has been made by Mr. C. J. Wilson, and is given later on.

The chimney draught was measured by a U gauge at the place where the furnace gases were collected.

*Feed Water Measurement*.—The feed was measured on its way from the hot-well to the feed pump, the latter being a Worthington pump entirely separate from the engine. A

4-in. pipe was connected with the hot-well, and terminated in a 4-in. two-way cock, by means of which the discharge could be turned into either one of two measuring tanks. At the bottom these tanks were connected to another 4-in. two-way cock, through which the feed pump could be made to draw from either of them. The tanks were so tilted that one corner was lower and another corner higher than all the rest, so as to render their filling and emptying more certain. They were fitted with glass water-gauges and with relief pipes. The method of operation was as follows:—The hot-well discharge—which contained the condensed steam passing through the cylinders, the jacket condensation, and also the steam used for heating the feed water, as well as the other quantities mentioned in the next paragraph—was allowed always to run into one or the other tank, and filled each one up in turn in about 3½ minutes. By means of the lower cock the feed pump was put into connection with the tank into which the hot-well was not discharging, and emptied it in about 2½ minutes. For each tankful there was therefore about one spare minute in which to ensure its complete emptiness or fullness and to note the temperatures, &c. During this time the feed pump had to be stopped, being started again directly the next tank was full. After the trial the tanks were re-erected with all their connections at University College, London, and water carefully weighed into them. It was found that one held 1,808 lb. and the other 1,785 lb. of water at 62° Fahr.; and also that the probable error of the filling and emptying as carried out on the trial was not more than 2 lb. in each tank, and was equally likely to be plus or minus. It seems therefore that the method of water measurement used, although very laborious, must have given very closely accurate results. A more elaborate system with storage tanks, which was preferred by the Committee, could not be carried out for want of room on the vessel. The temperature of each tank was taken, so that a very good average value of the feed-water temperature was obtained.

The steam made by the boilers, corresponding with the measured weight of the water, all went to the main engine, except the small quantity required to drive the Worthington pump, which may be fairly considered comparable with the quantity required for the feed pump of an ordinary engine. The circulating pump, the dynamo engine, the winch engines, the steering engines, &c., were all worked from a donkey boiler, which was specially kept going for that purpose. The exhaust from the circulating-pump engine and also that from the dynamo engine were both taken into the condenser, and therefore were measured through the feed tank on their way to the boiler again. These additions to the ordinary air-pump discharge more than made up for the various losses of steam through the engine: so that from time to time part of the hot-well discharge had to be thrown away, and not taken back to the boiler. The whole of the pipe connections between the boilers and engines, which were of very great complexity, were carefully examined before the trial, to make sure that no unintended communication existed.

**Power Measurement.**—Indicator diagrams were taken at half-hourly intervals throughout the whole trial. Six Crosby indicators were used, one on each end of each cylinder; the connections in all cases were through only a few inches of large pipe having in no case more than one bend.

The revolutions were noted half-hourly on the counter, all the gauges being read at the same time.

**General Conditions.**—The general conditions as to speed, power, steam pressure, frequency of stoking, and so on were all those of ordinary working on a southward journey, and were fixed beforehand by the chief engineer.

**Results.**—The results are shown graphically in Figs. 1, 2, 3, and 4, and their principal points are the following:—

**Duration of Trial.**—The trial, which was made on a voyage from Leith to London, commenced at 1.30 a.m. on Sunday, 24th June, and ended for the engines at 6.36 p.m. and for the boiler at 6.39 p.m. upon the same day. Its duration was therefore 17 hours 6 minutes for the engines, and 17 hours 9 minutes for the boilers. This small difference of three minutes arises from the fact that the signal for ending the engine trial; that is, for taking the last reading of the counter, was given three minutes before the water in the boiler gauge-glass reached the level from which it had started. The weather was fair throughout.

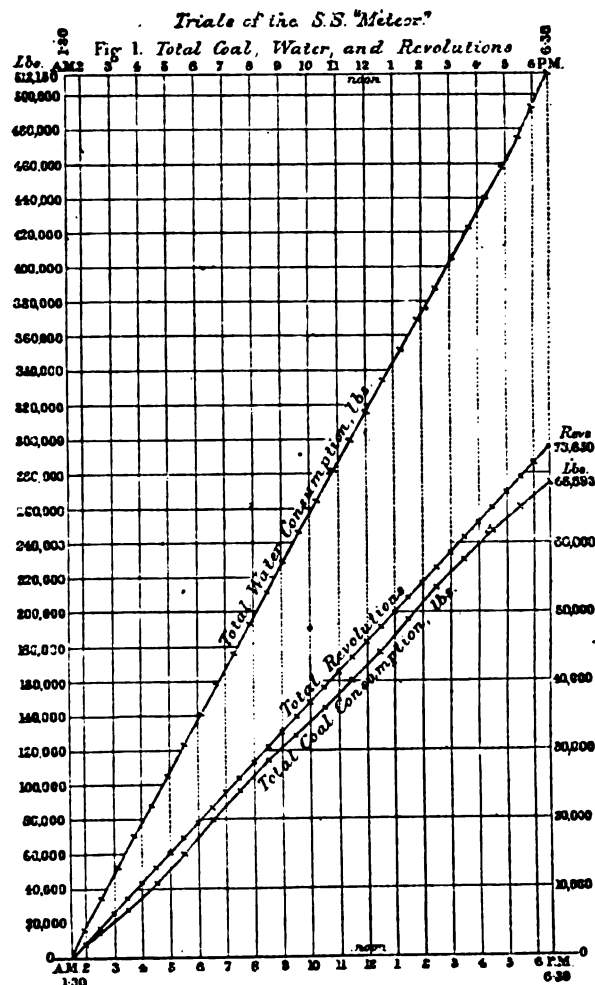
**Fuel.**—The coal used in the after stoke-hole was 16,675 lbs. upon the starboard side and 16,831 lb. upon the port side. In the forward stoke-hole these amounts were respectively 18,242 lb. and 16,945 lb. The starboard boiler therefore used 34,917 lb.,

and the port boiler 33,776 lb. of fuel. The total quantity was 68,693 lb., or 4,005 lb. per hour.

At the end of the trial it was found on cleaning the fires that the ash amounted to 1,671 lb., and the clinker to 2,806 lb. in addition. The ash was therefore 2.43 per cent. of the total fuel, the clinker 4.08 per cent. of the total fuel, and the two together 6.51 per cent. of the total fuel.

The mean temperature of the escaping gases, deduced from thirty-eight observations, was 791° Fahr. The chimney draught was constantly about 5-16ths of an inch of water. The sample of furnace gases which was brought successfully to analysis gave the following results by volume:—

Carbonic Acid	..	..	..	12.5	per cent.
Carbonic Oxide	..	..	..	0.8	" "
Oxygen	..	..	..	5.4	" "
Nitrogen	..	..	..	81.2	" "



This sample was collected at 11.30 a.m. under normal conditions of working. During the greater part of the trial the fires were worked very thick, indeed as thick as possible, and they were so at the end of the trial; as already mentioned they were not cleaned during the trial. Very much smoke was always emitted after stoking; but while no stoking was actually going on, there was not much smoke. The times of stoking were noted frequently, and on the average it was found that stoking occurred in each stoke-hole about every 24 minutes, all the fires being stoked one after the other as quickly as possible.

**Feed Water.**—The mean temperature of the feed water, which was heated before leaving the hot-well by an apparatus devised

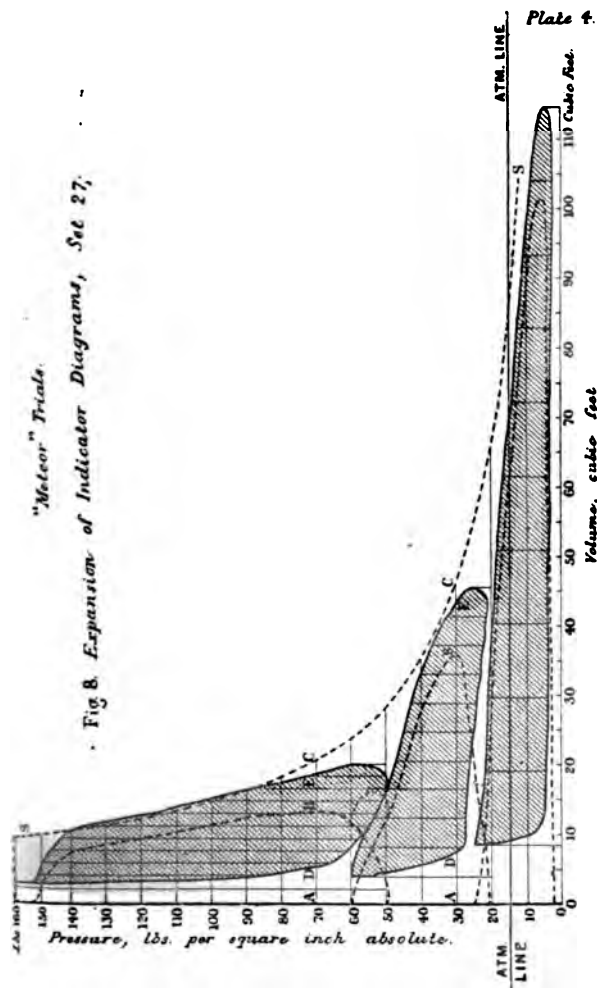


one set was 2,086, taken at 5.15 a.m. with 72.1 revolutions per minute and 147 lb. boiler pressure. The minimum I.H.P. given by any one set of diagrams was 1,890, taken at 12.45 p.m. with 70.9 revolutions per minute and 140 lb. boiler pressure. Each set of diagrams was worked out for the revolutions per minute corresponding with the counter-readings for the half-hour in which that set was taken. One set of diagrams—that nearest to the mean—is given in Figs. 5, 6, and 7.

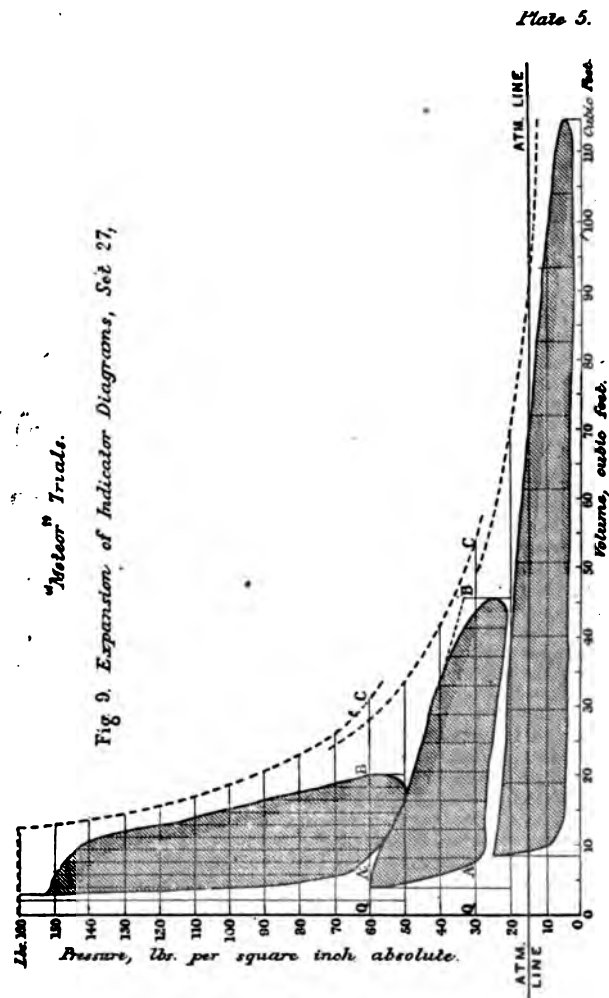
**Boiler Efficiencies.**—The rate of combustion in the furnaces was 19.25 lb. of fuel per square foot of grate surface per hour, or 0.602 lb. per square foot of total heating surface per hour. The evaporation was at the rate of 7.46 lb. of water per lb. of fuel put on the fire, including clinker. This water, being supplied at a temperature of 163° Fahr. and evaporated at a temperature of 363°, must have received heat at the rate of 1,062 thermal units per pound. Each pound of it was therefore

formation of carbonic oxide to 3.6 per cent., and that due to the evaporation of the moisture in the fuel to 1.2 per cent. The sample of coal analysed being free from clinker, the 4 per cent. of clinker may roughly be said to correspond to a loss of about 3 per cent. of the whole heat. These quantities add up to 91.7 per cent. of the whole heat of combustion; and the balance must include, among other things, all losses by radiation. The amount of water evaporated per square foot of tube surface was 5.18 lbs. per hour, and per square foot of total heating surface 4.49 lbs. per hour. These quantities have to be multiplied by 1.1 to bring them to standard conditions. The average rate of transmission of heat through the material of the boiler was 5,244 thermal units per square foot of heating surface per hour.

**Engine Efficiencies.**—The measurement of feed water shows that the quantity used per I.H.P. per hour was only 14.98 lbs.,



equivalent to 1.10 lb. evaporated from and at 212°. The actual evaporation reduced to this standard was therefore 8.21 lbs. of water per lb. of coal, or about 9.62 lbs. per lb. of carbon-value in fuel, allowing for clinker. The equivalent amount of heat utilised per lb. of coal was 7,922 thermal units, or say 62 per cent. of the whole calorific value of the coal, which percentage therefore represents the actual boiler efficiency. The total nominal calorific value of the fuel burnt per minute was 853,900 thermal units. Although it cannot be assumed that the analysis of furnace gas already given was a fair average, it has been thought worth while to work it out. It appears from it that the weight of air per pound of carbon was about 22.0 lbs., and per pound of coal about 15.5 lbs. The loss of heat in raising the temperature of the furnace gases works out to 21.9 per cent. of the whole calorific value of the fuel, the loss by



or within the limits of accuracy of measurement 15.0 lbs. The actual heat received by the feed water per minute was 528,700 thermal units, or 265.6 thermal units per I.H.P. per minute, which, as given in the last paragraph, is 62 per cent. of the whole heat of combustion. For purposes of comparison with a perfect engine, it may be assumed that the higher limit of temperature is that of the boiler steam, 363° Fahr., while the lower limit may be taken as 120° Fahr. It was unfortunately impossible to measure the temperature of the condensed steam as it entered the hot well; but with the good vacuum given above, it is not probable that it differed much from 120° Fahr. (The temperature corresponding to the mean back-pressure in the low-pressure cylinder is 146° Fahr.) If the engine had been "perfect" and had worked between 363° and 120° Fahr., it should have turned into work 0.295 of the heat received by it.

The heat actually turned into work was 85·240 thermal units per minute, showing an efficiency of 54·6 per cent. as compared with a "perfect" engine working between the same limits of temperature and receiving the same quantity of heat per minute. This is a high efficiency, but corresponds with the low feed-water consumption. The absolute engine efficiency, or ratio of the heat turned into work to the total heat received by the feed-water, was 16·1 per cent.

**Total Efficiency.**—The combined efficiency of the boilers and engines, or ratio of the heat turned into work to the total heat of combustion of the fuel, was almost exactly 10·0 per cent.

**Steam by Indicator Diagrams.**—Careful measurements of all the diagrams taken have been made to ascertain the proportion of steam accounted for by them, and the following are the results, the actual weight of feed-water used per revolution having been 6·93 lbs. :—

Proportion of Steam accounted for by indicator diagrams.	Lbs. per Revolution.	Percentage of Total Feed.	Percentage in Jackets or present in cylinder as water.
Steam present in high-pressure cylinder after cut-off, when the pressure was 110 lb. per square in. above the atmosphere	5·34	77·1	22·9
Steam present in intermediate cylinder, when the pressure was 22 lb. per square in. above the atmosphere	5·56	80·2	19·8
Steam present in low-pressure cylinder near end of expansion, when the pressure was 4 lb. per square in. below the atmosphere	5·22	75·3	24·7

It will thus be seen that even in these very economical engines, and with a liberal allowance for the steam used in jackets, which unfortunately could not be separately measured, there must have been a very considerable loss due to cylinder condensation.

In Fig. 8 are shown expansions of the set of indicator diagrams given in Figs. 5, 6, and 7, each expanded diagram being the mean of the two corresponding actual ones. The full lines in Fig. 8 show these mean indicator diagrams themselves drawn to the same scale of pressure and of volume, and placed so that the space to the left of each diagram represents the clearance space in the corresponding cylinder. The dotted lines in Fig. 8 show the same diagrams set back (in the manner described in Proceedings 1887, page 70) in such a way that at any pressure the horizontal distance A B measures the actual volume of working steam in the cylinder at that pressure, as represented by the difference between the volume of steam of that pressure in the cylinder during expansion and during compression, or A E — E D, independently altogether of clearance steam. Each horizontal distance or abscissa of the dotted curves, such as A B is therefore directly comparable with the corresponding abscissa A. C. of the saturation curve S S ;

and the ratio of the one to the other  $\frac{A B}{A C}$  at any pressure gives the "dryness fraction," or ratio of steam to be mixed steam and water, for the working steam at that pressure.

In Fig. 9 the same diagrams are treated in a somewhat different manner, proposed by Professor Unwin. The mean indicator diagrams themselves are here again expanded in the usual fashion, as shown by the full lines. The expansion line of each is continued to the end of the stroke at B, and the horizontal line Q A B is drawn. Then the length A C is set off from the compression line (produced if necessary) to represent the volume of the whole feed water per stroke (less jacket water, if any), if it were entirely steam of the pressure at B ; and a saturation curve is drawn upwards through C. Then at any pressure Q B represents the volume of the whole steam in the cylinder ; B C the volume of the steam corresponding with the water in the cylinder, apart from accumulated water if any ; while Q A shows the volume of steam in the clearance space when the same pressure is reached in the return stroke. The

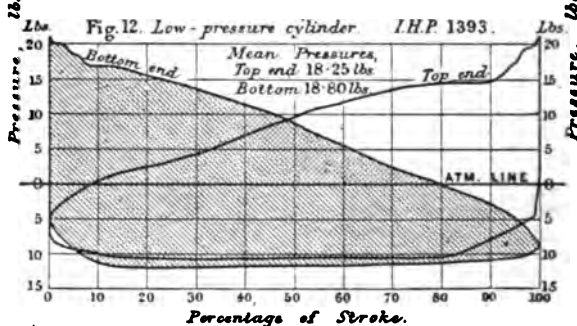
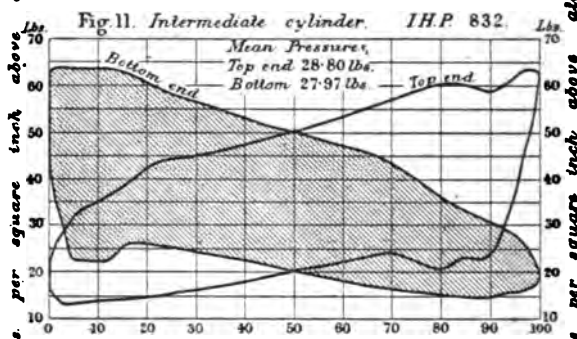
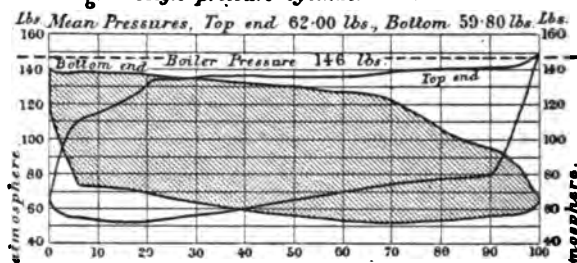
distance A B therefore represents the volume of working steam, and the ratio  $\frac{A B}{A C}$  the "dryness fraction" in the same way as the similarly lettered distances in Fig. 8.

**Coal consumption.**—The total coal put on the fires, 4,005 lbs. per hour, corresponds to 2·01 lbs. of coal per indicated H.P. per hour, of the quality already stated. This corresponds to 1·76 lbs. of carbon value per indicated H.P. per hour, or say 42·7 thermal units per indicated H.P. per minute. As each indicated H.P. per minute is equivalent to only 42·75 thermal units, this makes the combined efficiency of boilers and engines 10·0 per cent., as given above.

#### "Meteor" Supplementary Trial. Table 1, Set A.

Revs. 81·0 per min. Total I.H.P. 3003.

#### Fig. 10. High-pressure cylinder. I.H.P. 778.



**Speed of Vessel.**—The following notes from the log book of the ship may be of interest :—

	Time.	Distance in nautical miles.
Left Pier Head . . . . .	0.50 a.m.	0
Bass Rock . . . . .	2.20	20
St. Abbs Head . . . . .	3.40	39½
Ferns . . . . .	5.10	62
Flamborough Head . . . . .	0.50 p.m.	175
Dudgeon . . . . .	4.57	236
Cromer . . . . .	6.25	257
Haseborough . . . . .	7.0	265½
Cockle . . . . .	7.46	275

The mean speed between Leith and Cromer, which practically covers the trial, was therefore 14·6 knots.

**Supplementary Trial.**—Some hours after the main trial was finished, and after all the fires had been cleaned, the stoke-hole

was closed, the fans set to work, and the engine driven for a few hours at full power with forced draught. The particulars of the work done under these circumstances are given in Table 1. As to diagrams C, E, and F, which were taken with live steam admitted to the first receiver, it may be explained that the engine has an auxiliary starting valve of  $2\frac{1}{2}$  in. diameter, which enables this to be done. This valve is occasionally used when there is any fear of the boiler blowing off, so as to avoid waste of steam and fresh water. This occurs generally for only a minute or two at a time. The engines run from 2 to 3 and sometimes as much as 4 revolutions per minute faster, and it will be seen that the diagrams shown in Figs. 13 to 15, and Figs. 19 to 21, are much distorted, and the pressure on the intermediate piston much increased.

Table 1.—Supplementary Trial at full power with forced draught.

Indicator Diagrams	Set	Revolutions per minute.	Mean Pressure per square inch.			Indicated Horse-power.			
			High-pressure cylinder.	Intermediate cylinder.	Low-pressure cylinder.	High-pressure cylinder.	Intermediate cylinder.	Low-pressure cylinder.	Total.
			Lbs.	Lbs.	Lbs.	I.H.P.	I.H.P.	I.H.P.	I.H.P.
		Revs.							
A	A	81.0	60.9	28.4	18.5	778	832	1393	3003
B	B	81.0	63.2	28.8	19.0	808	844	1426	3078
C	C	83.1	30.2	33.7	24.1	397	1013	1893	3273
D	D	78.7	64.1	25.5	16.7	796	727	1222	2745
E	E	80.0	32.9	33.0	21.8	415	957	1617	2989
F	F	80.0	31.2	32.9	21.6	394	952	1608	2954

The four sets of diagrams A C D F are shown in Figs. 10 to 21.

Diagrams A (Figs. 10, 11, and 12) and B are believed to represent the average full-power working of the engines going north from London to Leith, when the steamer always runs with forced draft. Diagrams C (Figs. 13, 14, and 15) correspond to the conditions of A and B, but with live steam admitted to the first receiver.

Diagrams D (Figs. 16, 17, and 18) are believed to represent the average working of the engines later on in the same full-power run when the tubes are getting dirty, the high-pressure motion being drawn up about 1 inch. Diagrams E and F (Figs. 19, 20, and 21) correspond to the conditions of D, but with live steam admitted to the first receiver.

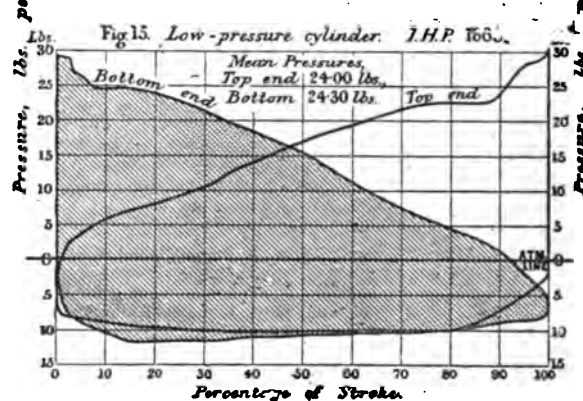
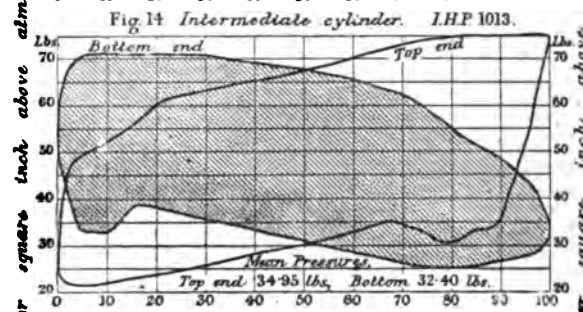
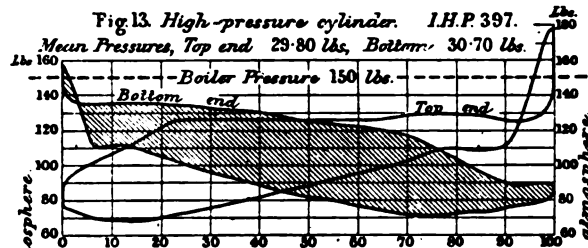
Indicated horse-power, high-pressure cylinder	I.H.P.	585
" " intermediate cylinder	I.H.P.	867
" " low-pressure cylinder	I.H.P.	1,208
" " Total	I.H.P.	2,660

It is interesting to compare the results thus obtained with those when running in forward gear (Figs. 5, 6, and 7), as showing the effect of altering the sequence of the cranks, which under these circumstances follow in the order—high, low, intermediate.

*Observers.*—As this trial was perhaps the first marine-engine trial carried out on any large scale at sea in which the feed water was measured and the coal weighed throughout for such a length of time, it may be interesting to mention the staff which was found necessary for the experiments. The work

#### "Meteor" Supplementary Trial Table 1, Set C.

Revs. 83.1 per min. Total I.H.P. 3273.



was carried on by two relays of observers, five in each relay, keeping alternate four-hour watches. Mr. Frederick Edwards took charge of one watch, consisting of Mr. Bryan Donkin, Jun., Mr. A. G. Ashcroft, Professor Beare, Mr. Beek, and himself. Professor Kennedy took charge of the other watch, on which were also Mr. C. L. Simpson, Mr. R. H. Willis, Mr. B. Bramwell and Mr. N. Burnett. One man in each watch took the feed-water measurements continuously; with him was an engineer, specially engaged for the purpose, to stop and start the feed pump as the tanks were changed in the manner above described. Two observers in each watch took the indicator diagrams and other observations in the engine-room; and two others attended to the coal measurements, one in each stoke-hole; these four interchanged places after two hours' work. As it is necessary that the ordinary work of the ship should

When the vessel got into port and was being berthed, it was endeavoured to get a set of indicator diagrams while the engines were going astern. One complete set only was secured, Figs. 22, 23, and 24, of which the following are the particulars, all the links being in full gear.

Boiler pressure, lbs. per sq. in. above atm.	lbs.	147
Revolutions per minute	revs.	76
Vacuum in inches of mercury	ins.	27
Mean pressure, high-pressure cylinder	lbs.	48.8
" " intermediate cylinder	lbs.	31.5
" " low-pressure cylinder	lbs.	17.1

not be interfered with, or the time of the engineer's staff encroached upon, an extra stoker was carried in each stoke hole for the purpose of filling the coal baskets to be weighed. An extra man was also carried to look after the donkey boiler, which, for reasons already mentioned, had to be kept going during the whole trip. Besides the ten observers already mentioned, there were thus seven others employed, allowing for change of watch. The whole trial, although requiring very close and continuous attention on the part of those engaged on it, went off without the least hitch of any kind, a fact which was no doubt due in a great extent to the very cordial help received throughout from everybody connected with the ship.

*"Meteor" Supplementary Trial. Table 1. Set D*  
Revs. 78.7 per min. Total I.H.P. 2745.

Fig. 16. High-pressure cylinder. I.H.P. 796.

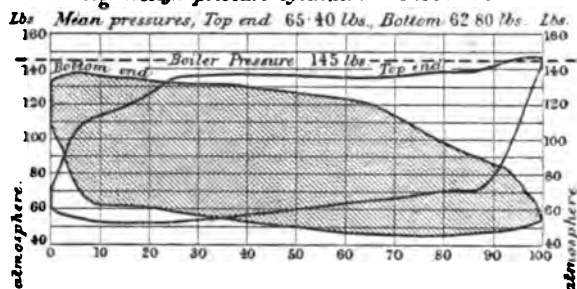


Fig. 17. Intermediate cylinder. I.H.P. 727.

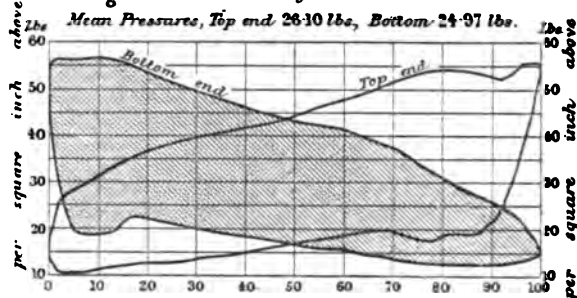
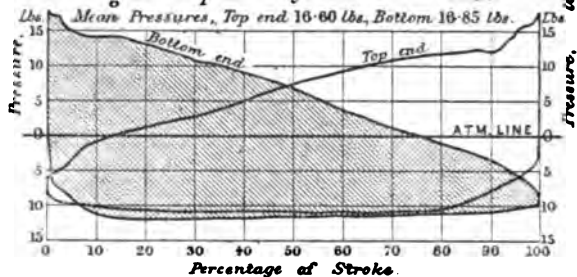


Fig. 18. Low-pressure cylinder. I.H.P. 1222.



but especially from Mr. Clephane, the chief engineer; his co-operation throughout was invaluable, and the Committee have much pleasure of taking this opportunity of acknowledging it. They are also indebted to Messrs. J. & G. Thomson, who have kindly furnished them with detail drawings of the cylinders and other parts of the engines; to Mr. C. J. Wilson, F.C.S., for analysing the furnace-gases and the coal; and of course in the highest degree to Mr. Aitken, of the London and Edinburgh Shipping Co., for his kindness in allowing the trial to be made, and for the trouble which he took in connection therewith.

It is now understood that the naval review at Spithead will be held on Saturday, July 27th. Every effort is to be made at Portsmouth to get the *Howe* ready to take her place in the line. She is waiting for her complement of 67-ton guns, but it is expected that the Elswick Ordnance Works will be able to supply three by the time mentioned, Woolwich undertaking to provide the fourth.

## THE PARIS EXHIBITION, 1889.

EXHIBITIONS of greater and lesser magnitude, and of international and local importance, have been so frequent in recent years, that to many, if not most, of our readers, another Exhibition year may appear to be superfluous; but special reasons have, as is widely known, actuated our neighbours across the Channel to celebrate in an imposing manner the year 1889, while at the same time, a laudable desire to extend trade and industries generally has played no inconsiderable part in leading the local and imperial authorities to expend so liberally, and perhaps in some respects so unwisely excessively, large amounts of money.

The function of a political economist does not, however, come within our range; and it is well, for more than sufficient food

*"Meteor" Supplementary Trial. Table 1. Set F.*  
Revs. 80.0 per min. Total I.H.P. 2954.

Fig. 19. High-pressure cylinder. I.H.P. 394.

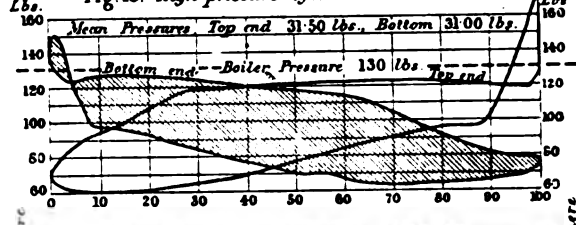


Fig. 20. Intermediate cylinder. I.H.P. 952.

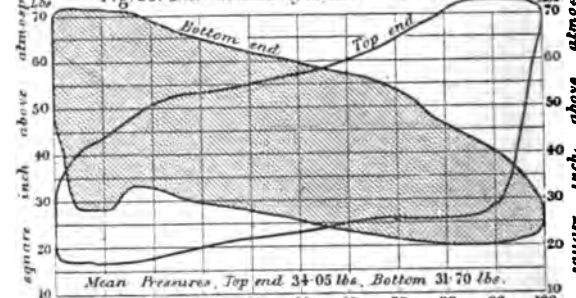
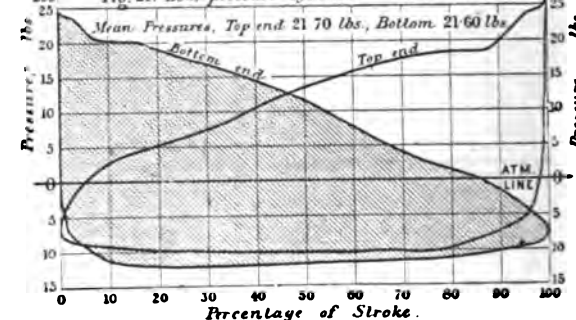


Fig. 21. Low-pressure cylinder. I.H.P. 1008.



(See page 101.)

for reflection, as constructive engineers, is presented to our view by this, the latest, and, we are bold to say, the grandest Exhibition it has ever been our privilege to notice.

Within our limits, even were it within our scope, we would fail to give anything like a comprehensive description of the buildings in which the multitudinous exhibits are placed; but so stupendous has been the preliminary work of preparing for the reception of articles intended for exhibition by the construction of the necessary accommodation, that we would be possibly blamable were the achievements of our engineering brethren in France, in this department, left unnoticed.

At first glance, the visitor is forcibly struck with the substantiality of all the buildings of the Exhibition. It might readily be supposed that the great bulk of the erections were designed to be permanent, even more so than the Eiffel Tower, for which a twenty years' concession has been obtained. More

particularly is this, if possible, true as regards "THE PALAIS DES MACHINERY," or, Anglicised, "THE MACHINERY HALL;" while its colossal proportions also create a great impression. It far surpasses in size any similar structure that has ever been constructed. It exceeds a quarter-of-a-mile in length, being 1,380 ft. long. Its central nave measures 375 ft. in width, and is roofed in one span. On either side are galleries 57 ft. 6 in. wide, each having a ground and a first floor. The clear height of the central nave at its centre is about 145 ft., and the Vendôme Column could be placed within it without touching the roof.

Probably the majority of our readers will form a better idea of the magnitude of the work involved in the construction of the Machinery Hall, when we remind them that its span is considerably more than one half greater than the greatest span of the kind already in existence, that of St. Pancras Railway Station, which is 230 ft. 6 in.

"Victor" Supplementary Trial. Engines full gear astern.  
Revs 76 per min. Total I.H.P. 2660.

Fig 22. High-pressure cylinder. I.H.P. 585.

Mean Pressures, Top end 51.70 lbs., Bottom 45.90 lbs.

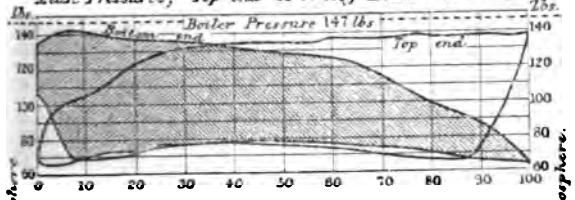


Fig 23. Intermediate cylinder. I.H.P. 867.

Mean Pressures, Top end 51.40 lbs., Bottom 36.60 lbs.

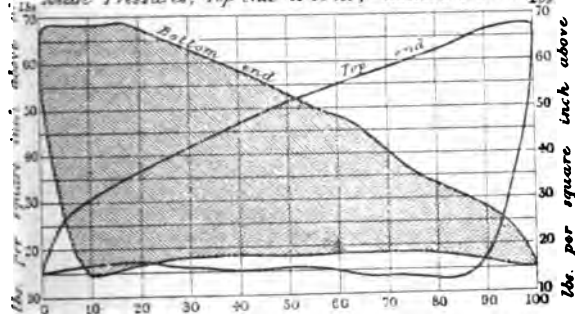
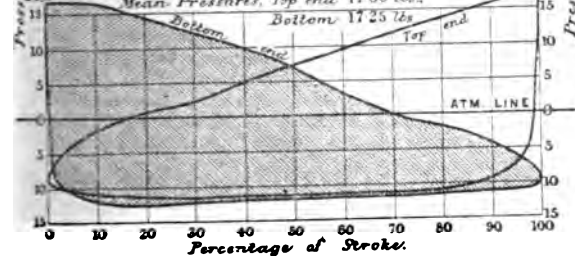


Fig 24. Low-pressure cylinder I.H.P. 1208.

Mean Pressures, Top end 17.00 lbs., Bottom 17.25 lbs.



See page 101.

The cost of this building alone, and which, as we will find, does not suffice for the machinery exhibited, was estimated at £260,000, but the estimate has been exceeded, and the actual cost is officially stated at £300,557, made up as follows:—

Earthwork and Masonry . . .	£23,697
Ironwork . . . . .	215,932
Woodwork . . . . .	7,750
Covering Lead and Zinc . . .	9,467
Flooring . . . . .	3,143
Joiners' Work . . . . .	1,373
Glazing . . . . .	7,289
Decoration . . . . .	10,244
Painting . . . . .	6,341
Miscellaneous . . . . .	7,605
Engineers . . . . .	7,715

Doubtless the Machinery Hall is the largest of the Paris

Exhibition buildings, but it only occupies somewhat less than one-twelfth of the area of the Champ de Mars, on which the main portion of the Exhibition is being held, although the Trocadero on the other side of the River Seine, united to the Champ de Mars by the Pont de Jena, forms no mean part of the World's Fair, while to many visitors the agricultural galleries, extending up the bank of the Seine beyond the Champ de Mars, will also prove very attractive.

In succeeding numbers we intend considering many of the exhibits, within our scope, in detail. Unfortunately they are not all massed together in the Machinery Hall. Large as it is, it has not sufficed for the Group VI., "Machines," Classes 48 to 66. Only fourteen out of the nineteen classes of the group could be located in the hall. Class 49, "Agriculture," including implements in motion, as already indicated, is being installed in the shedding of the Quai d'Orsay; and several separate spaces have been set apart in the grounds for the exhibition of machinery in special pavilions. Four other classes of this group, not requiring motive power, including Class 65, "Navigation and Life Saving," are placed on the Esplanade des Invalides.

Reverting to the Machinery Hall, a great and novel feature in it consists of two 10-ton travelling cranes of 18 metres, or nearly 60 ft. span, worked by electricity, and running on the lattice girders, to which the bearings of the main shaft are attached. These cranes have served for the delivery of goods to the six thousand exhibitors in this department, and now that the Exhibition is opened, is used for conveying the visitors (raised by any one of four lifts) from one end of the hall to the other, thus affording a panoramic view of the machinery in motion.

It was originally intended that all the exhibits in the "Machines" group should be classified, not by nationalities, but strictly by classes, French and foreign together, but this has been found to be impracticable, and what effort there has been made in the Exhibition generally to classify exhibits regardless of nationality, has greatly added to the labours and expense of the sectional committees. Four countries have distinct spaces allotted to them in the Palais des Machines. They are—Great Britain, the United States, Belgium, and Switzerland, and together occupy one-fourth of the whole area of the hall, viz., a rectangle 690 ft. long, 236 ft. wide, with the corresponding portion of the gallery.

Exhibits from Great Britain cover over one-third of this space; Belgium has about two-thirds of the floorage that our engineers, machinists, &c., have taken up; the United States has somewhat less space than Belgium; and Switzerland, which occupies a very favourable position to the left of the main entrance of the hall, has a total area of 32,390 square ft., Great Britain having 75,350 square ft.

It is evident, despite the official discouragements that the British Government has given to the Paris Exhibition, British manufacturers will not be so sparsely represented as it was at one time feared. Every available inch of space has been taken up by nearly 800 (exclusive of the Fine Arts Section) English exhibitors—and as far as possible the executive and the various sub-committees of the British section have subjected each application to the closest scrutiny in order to maintain a high standard of excellence. We anticipate none of our readers who visit the Exhibition will, under the adverse circumstances of our countrymen entering late into the field, &c., be ashamed of the British representation in the Paris Exhibition.

The following figures show approximately the number of English exhibitors in classes to which we will naturally give the most of our attention:—

Class 41. Products of Mining and Metallurgy . . .	38
„ 48. Methods and Processes connected with Mining and Metallurgy . . .	3
„ 52. General Machinery . . . . .	42
„ 53. Machine Tools . . . . .	14
„ 54. Spinning and Ropemaking . . . . .	1
„ 65. Navigation and Life Saving Apparatus . . .	27

It will be satisfactory to learn that at least in one respect British exhibitors are well to the front, viz., in having their exhibits placed and ready for inspection. This is true of about 90 per cent. of our exhibitors. Other foreign exhibits are also nearly as far advanced, whereas only 25 per cent. of the French exhibits are presentable at time of writing. We hope to illustrate and fully describe many of the exhibits of special interest to our readers, in subsequent numbers.

Some description of the means by which a supply of steam for moving machinery is supplied may not be ill-timed. All the steam generators are placed in a long row of separate buildings outside the Machinery Hall, in a space reserved for that purpose between the building and the boundary of the Champ de Mars adjoining the Avenue de la Motte-Piquet. This space is 100 ft. wide by 1,158 ft. long, and is nearly entirely occupied by boiler shops and the repairing shops of M.M. Ducommun. Eleven manufacturers have supplied steam generators. Ten of them are arranged in seven groups and placed in the following order, starting from the side of the Avenue de Suffren:—

1. MM. Fontaine and Dulac, of Lille.
2. Compagnie de Fives-Lille and MM. Weyher and Richmonde.
3. MM. Belleville & Co.
4. MM. de Mayér of Willebroek, in Belgium.
5. MM. Dayde & Pille, of Creil, and M. de Roser, of St. Denis.
6. Messrs. Babcock & Wilcox, of Glasgow, and Conrad Knapp, of London.
7. Messrs. Davey & Paxman, of Colchester, whose boilers are placed on the opposite side of the Machinery Hall, in the narrow space which separates the latter from the Miscellaneous Industries Galleries. These boilers form a part of the great central electric lighting station.

These seven groups of boilers supply the steam for driving all the machinery in motion and also all the steam that will be used in different parts of the Machinery Hall. The total amount of steam thus furnished will be, in round figures, equivalent to nearly 50 tons of water evaporated per hour, and of this quantity three English manufacturers and one Belgian firm will supply nearly one half.

The limits of our space prevents any details of the thirty-two motors used in driving the machinery in motion, of which twenty-eight will be used on the four lines of shafting which extend the whole length of the Machinery Hall, the remaining four driving smaller and special shafting.

Messrs. Davey, Paxman & Co. is the solitary English firm contributing to these principal motors, and have two engines, both condensing, one of them being of the coupled compound girder type, and the other the horizontal girder frame type. This firm also supplies a number of engines in the electric lighting department.

The water supply for the service of steam boilers, &c., is a matter of no small moment. It is obtained from the River Seine by means of two pumping engines, one is supplied by MM. de Quillacq and Meunier, and the other is a Worthington engine. The former is of the Wherlock type, and will drive a double-acting Girard pump, at a speed of thirty revolutions a minute. The latter is of the type, now so well known by report to our readers, and which will be very frequently found at work on board steamships within a short period.

Already sixteen Worthington pumps are used in the fastest steamer afloat, the R.M.S. *City of Paris*, of the Inman and International Line, and the same number in the sister vessel, R.M.S. *City of New York*. Nine Worthington pumps have also been fitted up in the *City of Berlin*, and in each of these instances, their quiet and uniform motion has given intense satisfaction to the staffs of marine engineers of these large steamers.

The Worthington high-duty pumping engine for the supply of water to the Exhibition, was specially designed for the service at the Paris Exhibition by Mr. Charles C. Worthington, of the well-known New York firm. This engine has a capacity of 6,500,000 imperial gallons per day, and in it are adopted several improvements suggested by experience. The steam valve mechanism has been somewhat modified, the main steam valve and the cut-off valves being circular, and placed immediately on top of the cylinders close up to the heads, so that all clearances and port spaces are reduced to a minimum. The steam cylinders are thoroughly jacketed, and the steam expanding from the high to the low pressure cylinder passes through a heater. The condensed steam from the jackets, as well as from the heater, is automatically pumped back into the boiler. There has also been introduced a new arrangement, by which the air pressure in the compensating cylinders, instead of being supplied from a large independent tank, is taken from the water main; so that any variation in the water pressure increases or diminishes the load upon the compensators, and the engine is slowed or quickened as necessary to restore the water pressure to its normal point. With this arrangement there is also the collateral advantage that if a break occur in the main, there is no danger of the engine being damaged. It

should also be stated that Worthington pumps are employed for pumping the water to work the hydraulic lifts in the Eiffel Tower.

#### THE RETROSPECTIVE EXHIBITION OF WORK.

Class XVIII. cannot escape mention in this first glance at the Paris Exhibition.

Section IV., which deals with the means of transport, is specially interesting. It is divided into four sub-sections, viz. (a) Transport by road; (b) Transport by water; (c) Transport by railway; (d) Transport in the air.

The second sub-section demands our notice. It is divided into six classes, viz.:—

- (1.) Means of ensuring marine routes, comprising charts, sounding apparatus, logs, tide meters, &c., buoys and signals, lighthouse illumination, &c.
- (2.) Means of ensuring shelter for ships, i.e., harbours of various forms.
- (3.) Means of facilitating commercial operations in harbours, docks, &c., including mechanical appliances for handling cargoes, storage arrangements for gunpowder, petroleum, &c.
- (4.) Shipbuilding yards and arrangements for the repair of vessels.
- (5.) Special processes for the construction and maintenance of ports and harbours.
- (6.) Seagoing vessels.

In both number four and number six, all the seagoing fraternity will be more or less deeply interested. The latter, owing to its importance, is divided into ten sub-classes, which are as follows:—

- (a) The means of navigation from the earliest times to the later centuries of the Egyptian Empire.
- (b) This class includes vessels of the Roman, Greek, and Carthaginian periods, up to the Christian era.
- (c) In this class the origin of marine navigation amongst the northern peoples of Europe is traced.
- (d) Here are seen vessels propelled by oars, from the Middle Ages to the present time.
- (e) Shipping during the reigns of Louis XIII. and Louis XIV.
- (f) Asiatic and African craft.
- (g) American and oceanic vessels.
- (h) The later developments of sailing ships.
- (i) The origin and development of steam navigation.

In this retrospective exhibition it is pleasing to see that our insular pride has not prevented first-class contributions being sent to this most elaborate and, we believe, fairly successful, attempt to pourtray the onward march of mechanics generally. The shipbuilding and shipping department of Great Britain was placed in good hands, being entrusted to Benjamin Martell, Esq., Chief Surveyor to Lloyd's Register of British and Foreign Shipping, and to William Parker, Esq., Chief Engineering Surveyor to the same society. Needless to say, these gentlemen have been successful in obtaining drawings and models of many historic and modern vessels; and so readily were their efforts seconded by shipbuilders and shipowners, that in several instances it has been found impossible to accept the proffered exhibits.

Doubtless many of the ships' models have done yeoman service, and most of them were to be seen at the Liverpool Exhibition of 1886, as on that occasion, in our article, "Among the Models," we gave full and complete descriptions of one of the largest collections of models of modern vessels that has ever been gathered together. In connection with this retrospective exhibition, a brief enumeration of the objects exhibited must suffice.

Other ship models will, later on, claim our attention, e.g., Sir Wm. Armstrong, Mitchell & Co.'s, Limited, Elswick Department, exhibit a full model of the recently built war cruiser *Piemonte*, as well as one of the *Esmeralda*, while Palmer's Shipbuilding and Iron Company Limited, of Howdon and Jarrow, have on view a full model of the belted cruisers now being built from their designs for the Spanish Government, at the new establishment at Bilbao. Messrs. C. S. Swan & Hunter, of Wallsend, have also several exhibits, and when we have had a complete inspection of the Exhibition, we anticipate to find many other miniature specimens of modern naval architecture. At present we are conferring our attention to the retrospective exhibition.

A model of the *Great Harry*, the largest war vessel owned by Henry VIII., built about 1540, comes first in chronological order,

and is one of the contributions of the London underwriters. The Elder Brethren, of the Trinity House, London, have forwarded a model of an old English light vessel, *The Well*, built in 1788, and a model of the *Goodwin* light vessel. A similar representation of the lifeboat *Willie Woodhead*, constructed in 1,790 forms one of the exhibits of the Borough of Tynemouth Free Library Committee, their remaining models being one of the wooden sailing ship *Blenheim*, built in 1850, and one of the mercantile screw-steamer *Crosby*, launched in 1870. A full-rigged model of a frigate constructed in 1780, has been forwarded by the Corporation of the Trinity House, Hull, as well as one of the Bull sand float (1848), and one of a lifeboat of 1850. Messrs. Edward Gibson & Son, of Hull, contribute a model of the ship *Faze*, of Whitby, a whaler built at the end of the last century. This vessel was burnt at sea, and the underwriters, having a suspicion of foul play, had the model built for the purposes of a trial. Messrs. Scott & Co., of Greenock, are represented by the full model of the East India merchant ship *Minerva*, built in 1824. Another famous Clyde firm, Messrs. W. Denny Brothers, of Dumbarton, have on view models of the paddle steamer *Loch Lomond*, built in 1845 for river traffic on the Clyde between Glasgow and Dumbarton, and of the iron paddle steamship *Stag*, constructed in 1853. The well-known Wear shipbuilder, Jas. Laing, Esq., of Sunderland, has forwarded an exceptionally interesting model of a favourite cargo sailing ship built in 1851, which formerly traded between London and Sydney. One side of this model is planked, while the other half is in frame. Messrs. W. O. Taylor & Co., of Dundee, have lent to the committee a model of the whaler *Jan Mayer*, of Dundee, made of a piece of teak which formed a portion of a steam launch left at Port Leopold, Prince Regent's Inlet, by the Franklin Relief Expedition in 1857. A full-rigged model of a ship constructed in 1854 has been forwarded by Mr. Thomas Foske Trilly, of South Shields. Messrs. Charles Connell & Co., of Glasgow, are well represented by a full model of the world-famed three-masted composite tea clipper, *Spin-drift*, built in 1867, not the *Spendthrift*, as stated in one of our weekly technical contemporaries, who ought to know better. By the way the same paper calls the Wearside shipbuilder referred to above, Mr. James Lang, M.R. Messrs. David and William Henderson & Co., Glasgow, have, as a representation of their skill in naval architecture, a full model of the paddle steamer *Lord of the Isles*, which although now twelve years old is as popular as ever on the Wemyss Bay and Inverary service. The London and Glasgow Engineering and Iron Shipbuilding Company of Glasgow exhibit models of the ship *Glenartney*, built in 1873, the screw steamer *Champlaine*, built in 1874, and the Great Eastern Railway Co.'s paddle steamer *Princess of Wales*, built in 1876. Messrs. W. & B. Thompson, of Dundee, have forwarded a full-rigged model of an iron sailing ship of 4,000 tons of the latest type, with four masts. Messrs. J. Wigham, Richardson & Co., Walker, Newcastle-on-Tyne, show a model of the *Lilliebell*, constructed in the year 1871, for the purpose of conveying railway trains from the Island of Denmark to the main land. As a pioneer in this class of work the vessel is of great historical interest.

Messrs. Hepple & Co., of North Shields, have constructed a model of an iron passenger and cart and horse ferry steamer, which they constructed in the year 1878, and is now plying on the River Tyne. The model of the paddle steamer *Bessemer*, built for the cross channel service in 1874, and which was to ensure freedom from sea sickness, should not be overlooked. It has been forwarded by the builders, Earle's Shipbuilding and Engineering Co., of Hull.

Possibly we may be able, in later numbers, to further notice any other exhibits in the retrospective exhibition which we may deem of sufficient interest to our readers; but pressure on our space prevents further reference at present.

In closing this necessarily brief and cursory glance at the Paris Exhibition, whatever may be our opinions as to the advisability of having a tower 1,000 ft. high in connection with an Exhibition, we would be selfishly neglecting what will be, after all, one of the chiefest objects in the eyes of engineers, as much, probably, on account of its novelty as upon the skill that has been displayed in its design and construction. The fact that the Eiffel Tower is 1,000 ft. high, and that it is accessible to visitors by hydraulic lifts, strikes one forcibly; and when we inform our readers that no less than 7,300 tons of iron has been used in its construction, that the weight of rivets used was 450 tons, and that their total number was 2,500,000—800,000 of which were rivetted by hand—and that 12,000

separate pieces of iron goes to make up the structure, we may consider to have, in a few words, given some idea of the magnitude of the Eiffel Tower.

## STOKERS OF THE ROYAL NAVY.

COMPARED with the engineers of the Navy, very little indeed appears to be known by the public or shipping community generally respecting the above-mentioned stokers. Inasmuch, however, as the extent and variety of the duties they have to perform have recently much increased, both in laborious exertion and importance, and as it is proposed to add 1,000 to their number, the time has arrived when it is desirable to publicly notify the main facts concerning them with regard to their training, promotion, pay, pensions, and the new duties imposed upon them. These particulars we will now mention.

The stokers of the Royal Navy consist of five classes, viz.: Stokers; 2nd class stokers; leading stokers; chief stokers; and stoker mechanics.

Able-bodied men of good character are eligible for employment as stokers in H.M. ships, whose age is between 18 and 25; their height must not be less than 5 ft. 4 in., while their girth of chest between the age of 18 and 20 must be 33 in. and 34 in. when they are over 20 years of age. As a general rule stokers should have served in the 2nd class, and should be fit for the rating. Properly qualified men can, however, enter as stokers at once. All stokers and 2nd class stokers are to undergo a course of instruction in rifle and cutlass drills before being drafted to sea. It is necessary that a 2nd class stoker should have a fair knowledge of such drills before he can be so rated as a stoker. In training for 2nd class stokers, boys are instructed under the direction of the Captain of the Steam Reserve at Portsmouth, Chatham or Devonport, and their stoking duties are performed in ships in harbour, and they are promoted as stokers as soon as they are qualified for such. It is generally about three or four months after the lads commence training before they are sent to sea.

A leading stoker must be above 18 years of age, and have a good character and steady conduct. In appointing persons as leading stokers, preference is given to the most competent stokers who are qualified for the rating. The examination to be passed for these posts is that those who are to fill them must read and write fairly.

A chief stoker's qualifications are that he must have had ten years' service as stoker, which must not include more than two years in the 2nd class, or other Naval ratings. He must also have a very good character for conduct and experience, and must read and write well.

A stoker mechanic must actually be borne as stoker or leading stoker. He will have to pass an examination to show that he can work efficiently as engine fitter, millwright, boiler maker, blacksmith, coppersmith, tinsmith, or plumber and moulder. A pattern maker or a tinsmith may be accepted for employment as stoker mechanic in a home port.

The rates of continuous service pay by the year is as follows, viz.:—Stokers, 2nd class, £30 8s. 4d.; stoker, £36 10s.; leading stoker, £44 2s. 1d.; chief stoker, under three years' service as chief petty officer, £53 4s. 7d.; ditto, over three years' service as chief petty officer, £62 7s. 1d. Men who do not desire to avail themselves of the advantages of the continuous service system can enter for five years and receive 3d. per day, or £4 11s. 3d. a year less pay; but these entries are not made under ordinary circumstances. Only continuous service men can become chief stokers.

Beyond the above rates of pay, three badges can be obtained by stokers, leading stokers, and chief stokers, for good conduct, and 1d. a day (£1 10s. 5d.) a year, is allowed for each badge.

Stokers of the 2nd class, stokers, leading stokers, and chief stokers, can qualify for stoker mechanic, and will then receive further pay of 3d. a day (£4 11s. 3d.) a year, or 4d. a day (£6 1s. 8d.) per annum, if also qualified as artificial diver. Stokers, leading stokers, and chief stokers, can also qualify for trained men, as afterwards mentioned, and will then receive a further remuneration of 1d. a day while holding the rating.

Under certain conditions, moreover, as subsequently particularised, extra pay is given to the several classes of stokers employed in torpedo boat duties.

Men who enter the stoking employment for twelve years' continuous service receive £1 for bedding, and a gratuity of £2 10s. towards their outfit on arrival at the port, and similar gratuities on re-engaging for a subsequent period of ten years. Persons, however, who enter as non-continuance service men, receive the same allowance for bedding, but no gratuity for clothing. They, nevertheless, get a further credit on account of gratuitous bedding at the end of each five years' service.

Clothing can be bought from the ships' stores at a much cheaper rate than it can be purchased ashore, and working dresses for dirty work are allowed gratis.

The pensions awarded to men after 22 years' service amount to from £18 to £50 per annum. Persons, however, who continue their stoking services after this period can obtain larger pensions. Gratuities are also given, in addition to the pensions, extending from £5 to £15 to continuous service men for exemplary conduct on being pensioned.

Men who are disabled in the service receive either gratuities or pensions (temporary or permanent) amounting to the extent of their disability. However, the widows and children of men killed or drowned on duty are eligible for pensions and allowances.

All classes of stokers are permitted to make allotments of their pay to any person in the United Kingdom, the Channel Islands, Isle of Man, Malta, Gibraltar, and Halifax, N.S., and to remit from abroad a large proportion of their pay.

Leave on full pay is permitted both when serving at home and on return from foreign service. After a full term of foreign service, six or eight weeks' leave can be obtained.

Stokers, leading stokers, and chief stokers can be appointed to the Coast Guard.

Extra pay is allowed to leading stokers, stokers, and stokers of the 2nd class, while steaming in the Tropics. Those of these classes who are actually employed when the steam is up in the ship, or a steamboat when within the Tropics, or between the 1st of April and the 30th of November inclusive, when within the Red Sea or Persian Gulf, are entitled to extra pay, equal to half the pay of their ratings, in addition to their full pay. This further remuneration, however, is not to be paid for any time during which the fires are merely banked, or when the steam is only used for condensing water.

All these classes of stokers belonging to surveying ships when used in surveying, but not on ordinary passages, are likewise entitled to the before-mentioned allowance under the following circumstances, viz., when between the Northern Tropic and lat. 30 deg. North, between the 15th of June and 15th of October inclusive; or between the Southern Tropic and lat. 30 deg. South between the 15th of December and 15th of April inclusive. The allowance of 3d. a day granted to stokers' mechanics, in addition to the pay of their ratings, is not to be included in the computation of tropical pay.

In each ship the engineer officer selects a competent leading stoker, or stokers, subject to the captain's approval, to assist in the care and issue of the engineers' stores.

When the ship is under steam the stokers are not to be called out of the engine-room unless in cases of actual necessity. In all instances the order is to be given through the engineer officer on duty in the engine-room, so as to enable him to take such precautions as may be necessary.

Stokers coming off duty are required to wash themselves properly, and put on dry and clean clothing, previous to returning to their messes or going to their hammocks. After each watch they are to be mustered and inspected in such place as may be selected by the captain, or by an engineer officer, who is to be satisfied that such instruction has been properly attended to.

Chief stokers, when borne in H.M. ships, are to mess with the chief petty officers, and not with the engine-room artificers.

An important regulation has been made for the instruction of stokers in rifle drill. It is provided in the "Queen's Regulations and Admiralty Instructions," that all chief stokers, leading stokers, stokers and 2nd-class stokers, are to receive instruction in rifle, cutlass, and pistol drills, from the gunnery staff of the ships in which they serve.

When a ship is ordered to be paid off, the stokers are not to be withdrawn from the work at once connected with the engine-room, but are to be at the disposal of the engineer officer, to enable the latter to get the engine-room bilges in clean and in proper order before inspection by the Captain of the Steam Reserve. The screw is to be raised ready for examination before the day of paying off.

By far the most important recent regulations with regard to

stokers are those which impose duties upon them in torpedo boats. So significant are those duties, that those who are able to perform them efficiently must logically be classed as skilled workmen. It is provided that any qualified chief stoker, leading stoker, or stoker who is engaged on torpedo boat service, is to receive the regular additional pay of 1s. 6d. per day, when living on board by order, and actually cruising away from his ship, either with a fleet at sea, or in running out lengthened experiments. If, however, they are employed in running these boats for educational or experimental purposes, for not less than six hours continuously a day, but under the conditions of harbour service, he is to receive 4d. a day.

Continuous service chief stokers, leading stokers, and stokers, are to be trained in the working of machinery and management of boilers of torpedo boats. On proving their efficiency they are passed as qualified.

Any chief stoker, leading stoker, or stoker who is qualified in torpedo boat work, and can pass the examination for trained men in cutlass, rifle and pistol exercises, is to be rated a trained man, and to have 1d. a day additional pay. If it is found necessary to employ on torpedo boat work any of the last-mentioned classes of stokers who have not qualified, the same extra pay of 4d. a day may be granted to them; but in all instances the preference for such employment is to be given to qualified men.

With regard to the machinery and boilers in torpedo boats, instruction in duties respecting these will be given by engineer officers, under the direction of the Captains of the Steam Reserve at Chatham, Portsmouth and Devonport, and the senior officer at Malta and Hong-Kong and other foreign dockyards where torpedo boats are stationed.

Each chief stoker, leading stoker, and stoker should, during his training, make at least six runs both in a 1st class and a 2nd class boat, two of which should be at full power and the others at powers varying from half to three-quarters' full power.

A man should not be reckoned qualified until he can keep steam for full power for any time directed. When a man has passed as qualified, a notification to this effect is to be made in his certificate.

On returning to a Steam Reserve after three years' absence or more, a man should be re-qualified if in all respects he is fit for the work. If this condition cannot be complied with, the man's rating is to be taken away.

The names of trained men in a ship is recorded after those of stoker mechanics in the engine-room register, and the letters T.M., in red ink, is to be placed after the name of each trained man. If such a person is thought incompetent for torpedo boat duties his name may, with the approval of the commander-in-chief or senior officer in charge of the station, be removed from the list of trained men, and his additional 1d. a day is to cease from the date of such removal. A notification of this is to be made on his parchment certificate.

The instructional torpedo boats are to be changed occasionally in order that instruction may be given in working the several types fitted in the different torpedo boats. When an instructional boat is laid up for repairs or periodical survey another boat of the same class is to be substituted temporarily. The latter is to be returned in an efficient state when the instructional boat is again fit for service.

When the ships of the Mediterranean and China squadrons are at Malta or Hong-Hong respectively, opportunities are to be taken to give the torpedo boat chief or leading stokers, and stokers, practice in the torpedo boats set apart for the purpose at those ports. If possible the practice is to consist of four runs in each boat, two of which should be made at full speed. Every such run is to be made for an hour continuously.

The captains of ships carrying torpedo boats have to arrange for each of their craft to steam twice a month for about an hour-and-a-half each time, at about three-quarters speed, and once during every three months for an hour at full speed. This exercise is to be in addition to any steaming that may be required for torpedo boat practice.

A record in the ordinary engine-room register is to be made of the particulars of the working of the machinery of the instructional boats. Such particulars concerning 2nd-class torpedo boats attached to ships are to be marked in red ink in the engine-room register of the ship.

While the chief or leading stokers, or stokers, are training, arrangements are made for each engineer officer and engine-room artificer in the Reserve to be present as often as possible during the steaming of the instructional boats, so that they

may become familiar with the construction and working of the machinery and boilers of such boats.

Considering the very important and responsible additional work that is now entrusted to stokers of all classes in the Royal Navy, it is very essential that a much better class of men should enter the service than have hitherto done, and to satisfy this requirement for the most part, we think that better pay and pensions should be awarded to them.

### EXTENSIONS AT JARROW FORGE.

ON Tuesday afternoon, April 30th, upwards of a hundred ladies and gentlemen from Newcastle and other places on Tyne-side assembled at Jarrow Forge to inaugurate a 5-ton hammer with the usual furnaces, cranes, and other accessories which have just been added to the existing plant, and intended to be used principally for rough and heavy forgings. A new smith's shop, for finishing ships' forgings, has also been completed. These additions are calculated to greatly enhance the facilities of the Company for turning out the class of work for which they have earned so good a name—notably, ship and engine forgings in the rough and finished condition.

The ceremony of christening the hammer was performed by the little daughter of Councillor Dent, the managing director; after which, photographs of the works and workmen, as also of the directors and their guests, were taken by Mr. Piper, of Gateshead.

Proceeding next to the Mechanics' Institute, the company sat down to a repast, presided over by Mesdames John Robinson, M. Dent, G. H. Dexter, and T. J. Robson.

Alderman Dickenson proposed success to the Jarrow Forge Co. and its new hammer, coupled with the name of the managing director, Mr. Dent.

This was supported in a highly appropriate speech by His Worship the Mayor of Gateshead (Alderman John Lucas), and responded to by Mr. Dent, who spoke of the satisfactory results of their work in the past; and referred to orders recently completed or in hand, for most of the shipbuilding firms in this and surrounding districts, and for customers all over the world.

A dance had been arranged for the young people, and forty or fifty couples kept up the proceedings with great spirit until a late hour.

The whole programme passed off most satisfactory, and on all hands prompted the hope which was expressed, that it might be a happy augury for the continued success of the promoters.

### THE INSTITUTE OF MARINE ENGINEERS.

At a meeting of the above Institution, held at the Langthorne Rooms, Broadway, Stratford, E., on Tuesday, the 14th inst., at 8 p.m., the Honorary Secretary, Mr. James Adamson, read an apology from Mr. Manuel, who had promised to read a paper "On Propellor and Crank Shafts," for that date, he having been unexpectedly called away on official duties, at the same time said he had the pleasure to inform those present that Mr. John McFarlane Gray (of the Board of Trade), had kindly consented to read a paper instead "On Pressure."

Mr. Gray remarked that had time permitted, he had contemplated, in the first instance, reading a paper on some striking improvements in Marine Engines, but the subject he proposed to submit was of such a nature as to require great consideration and thought by engineers in the first instance, and he earnestly impressed upon them to endeavour to put aside the thoughts of hasty advancement for pecuniary interests, but to fully study the interests of the profession and secure sound knowledge first, and they would then be sure to find good results follow. He personally referred as to strict and careful attention to minute details, until one had thoroughly mastered them, and instanced several matters to which he solely attributed whatever progress he had made in the profession.

Mr. Gray then most ably dealt with the subject of "Pressure," and in a very clear and simple manner dwelt upon the various theories advanced, in relation to the Particles or Molecules of

matter pressing against each other, and dealt fully as to the question of "loss of velocity," "loss of energy," and with heat and steam in respect to "relation," and "pressure by volume" in relation to "energy," and gave a series of practical examples, illustrating same by diagrams, in support of his particular views, and expressing same by means of formulæ, where "energy" being expressed by foot pounds and "pressure" by volume as to "velocity" or results.

The author likewise pointed out how necessary it was for engineers, in seeking for results, to agree and deal with definite symbols in formulæ, so that it should be uniformly understood that each should express, as a factor, the particular force, power, or expression to be dealt with.

A discussion upon the subject was then invited, but did not meet with a very ready response, but Mr. Hawthorne, in reply, fully admitted, on his part, as to the necessity for giving careful attention to so-called trifles, also in respect to the question of pressure, &c., he fully agreed with the author's views and the value of the formulæ submitted, also to several other points raised, and in a diagram showed a very simple method he had himself found out for squaring the area, &c., of any subject; he also spoke as to the necessity or value of symbols being uniformly and carefully followed in all engineering calculations, and as a Member of the Council, he hoped that Marine Engineering Students would speedily take advantage of the facilities afforded them by the Institution and join as graduates, as they would then have the opportunity of doing what is necessary, to work practically first and study at leisure afterwards.

A vote of thanks to the Author having been passed, Mr. Gray said that he was glad to notice the rapid progress made by the increase of members and associates, and to the general surroundings of the Institute, and as to the particular interest and pleasure it gave him in doing all in his power to further its objects, and highly complimented Mr. Adamson (hon. sec.), for having devoted his time and exertions so successfully.

The Honorary Secretary informed the Members that the Council had made application to the Board of Trade for the "Institute of Marine Engineers" to become an Incorporated body, under Government, and that it had so far passed and been accepted; it now only awaited the usual short space of time when a Royal Charter would be granted it.

### CLYDE-BUILT DREDGERS IN MELBOURNE.

A CORRESPONDENT of the *Glasgow Herald*, writing on the 21st of March, says:—A short time ago notice was taken of a complaint by the Trades' Hall Council of Melbourne that the Melbourne Harbour Trust had ordered two dredgers from Glasgow, instead of having them made in the colony. A deputation waited on Mr. Gillies, the Premier, to remonstrate with him on the proceedings of the Harbour Trustees, and requested him to have the order given to the Glasgow builder cancelled. It turned out that this could not be done, as the dredgers were already being built on the Clyde. However, a great deal of correspondence on the matter was carried on for a time, and the Harbour Trust was requested by the Premier to give some explanation why tenders were not called for the dredgers from colonial firms. A report from the Trust has just been published, in which that body shows a good deal of independent spirit. That report states that it would be quite contrary to their Acts of Incorporation for the Trust to permit its executive powers to be controlled or influenced by any irresponsible section of the public interested in special trades. It states, moreover, that the knowledge and experience of the Commissioners made them aware that local contracts for heavy machinery were seldom completed to time, and gave several instances of this delay in proof. As to cost of local work as compared with similar work done at home the Commissioners instance the Government hopper-dredger *John Nimmo*, which was constructed on the Yarra. That dredger was to have been completed in eighteen months, but was not delivered until two-and-a-half years. The cost of the *John Nimmo* to the Government was £51,000, which sum left the builders a very heavy loss on the work. Moreover, the report states that the dredging power of the *John Nimmo* is inferior to that of the *Crocodile*, which was built on the Clyde by Messrs. William Simons & Co. in 1883, for the sum of £22,700, and was delivered in Melbourne

three months over date. In the case of the *Crocodile* the report mentions that tenders were called for its construction both at home and in the colonies, and the colonial tender was 45 per cent. higher than the British price. In the endeavour then made to have the *Crocodile* built in the colony six months were spent, and the order had at last to go to Scotland. The Harbour Trustees are desirous to have as much of the work of the Trust as possible done here, but time is an essence of the contracts, especially seeing that the works of the port of Melbourne must be pushed on to convenience the shipping, and in making the harbour safe for the large vessels that now come up to the wharves at Melbourne and the much larger ones that berth at the piers at Port-Melbourne and Williamstown, in the bay. Mr. Loader, one of the Harbour Trustees, in seconding the adoption of the report, said the Trust must look to other labour markets than those of this colony for the supply of large machinery, simply because the manufacturers of the colony were not equal to the task of supplying it. If they depended on this community, the port would soon be unnavigable. The Trust did not wish to injure any of the operatives of the colony, but insisted on its right to purchase plant in the most suitable market. Mr. John Blyth affirmed that the *Crocodile* (Clyde-built) could raise double the amount per hour that could be raised by the *John Nimmo*, which cost twice as much. He added, if it were a mere matter of 25 per cent. he would willingly give the work to be done in the colony, but it could not be done even at that sacrifice, and he was certain that the work required could not be done either this year or next for double the sum in the colony that it could be done for in Britain. Alderman Mowbray, a member of the Harbour Trust, said that, as a citizen of Melbourne, he was not going to be dictated to by the Trades' Council. The Harbour Trust should let it be known that they were not responsible to everyone who choose to ask them their reasons, and it was not to satisfy the Trades' Hall Council, but simply out of courtesy to the Premier that the reply as made in the report was drawn up. The report has been forwarded to the Premier, and seems to furnish a telling reply to the complaint of the Trades' Hall Council anent ordering dredgers from the old country.

### FORCED DRAUGHT.

THE Admiralty have issued a new section to the Queen's Regulations with reference to the use of forced draught in Her Majesty's ships. The substance of the changes was embodied in the annual statement of the First Lord, but the full text of the order is as follows:—1. In ships fitted with closed stokeholds and fans, the term "natural draught" or "open stokeholds" implies that the air required for combustion, ventilation, &c., is supplied by the fans, but with little or no pressure (as indicated by the water gauge), and with the stokehold doors open or closed as may be found desirable. 2. It will probably be found more convenient, when under steam to keep the stokeholds closed, and to use the fans, their speed being regulated as required to supply the air necessary for the fires and the proper ventilation of the boiler rooms. 3. It is to be distinctly understood that forced draught appliances are not to be used at their full power, or, in other words, above the  $\frac{1}{2}$ -in. pressure, except in circumstances of emergency, and then only for short periods, when the maintenance of the highest possible speed for three or four hours may be of great advantage. 4. The same appliances must be made use of, however, under most conditions, for securing the proper supply of air to the boiler rooms when vessels are steaming at moderate speeds; and within the limits of air pressure mentioned in Clause 5, the boilers may be worked continuously over the full period for which coal is carried. 5. The specified natural draught power can usually be obtained with an air pressure not exceeding  $\frac{1}{2}$  in. of water, and this is to be considered the full power of continuous steaming at sea. The boilers and engines are not to be forced beyond this, except in cases of emergency, as explained in Clause 3. 6. During the quarterly passage trials at sea the engines are to be worked up gradually to this specified natural draught power, which should be maintained continuously throughout the four hours' trial, the air pressure not being allowed to exceed  $\frac{1}{2}$  in. of water. 7. The maximum specified power with forced draught is obtained with air pressure of  $1\frac{1}{2}$  in. to 2 in. of water, and this is provided to be applied in cases of emergency, and for periods only. On general service the boilers are never

to be forced to this extent, except under the direct orders of the commander-in-chief, who will, in his report of proceedings, explain why the special orders were given. 8. The indications of the air-pressure gauges are to be recorded in the engine-room registers every hour. 9. The fans are not to be used for the purpose of rapidly urging the fires and raising steam quickly, and all the instructions in the Steam Manual as to the necessity of avoiding rapid changes in the pressure of the steam and the temperature of the boilers are to be strictly followed. 10. It is important that the boilers should be supplied with fresh water only, so as to avoid the deposit of solid matter on the heating furnaces; and the instructions respecting the cleanliness of the boilers must be strictly followed. Special attention should be paid to maintain the efficiency of the double distillers or evaporators, which are provided for the supply of fresh water. Sea water should never be used for feeding the boilers unless absolutely necessary. 11. The instructions in Clauses 5, 6, and 7 are not to apply to torpedo gunboats, or other vessels with locomotive or special types of boilers, for which special instructions are given in the Steam manual.

### TRIAL TRIP OF THE S.S. "MEATH." 200 lb. PRESSURE AT SEA.

AN event of more than ordinary interest to marine engineers took place on Saturday, May 18th, in the trial trip of the steamship *Meath*, which has just been fitted with quadruple engines by the Scotia Engine Works Co. It is a matter of common recollection that in 1867 and 1868 shipowners very hesitatingly adopted the compound engine with a pressure of steam from 65 lb. to 70 lb. In the short space of about five years the compound engine was practically the only type of engine made, and the pressure rose from 65 lb. to 90 lb. This was the state of things which continued until about 1880, when a pressure of 160 lb. with triple-expansion engines began to be introduced. This type of engines in a very short space of time completely superseded the compound engine, but from then until now no great advance in pressure of steam used has been made, the highest reached having been 180 lb. Special interest therefore attaches to the trial trip of the steamship *Meath*, of Sunderland, belonging to Messrs. R. M. Hudson & Sons, which vessel, having undergone extensive alterations, and having been lengthened 36 ft., has had her old engines quadrupled by the firm of Messrs. Wm. Allan & Co., of the Scotia Engine Works, the pressure of steam employed being 200 lb. The old boilers used with the compound type of engines were two in number, but in the higher pressure three boilers are employed, fitted with Purvis's patent ribbed flues, occupying no more space transversely than the original boilers. By the employment of 200 lb. pressure it was observed on the trial that a great increase in power, and consequently in speed, was obtained, the engines indicating 1,850 H.P., whilst the mean speed of the steamer was 12.25 knots. The previous H.P. was 900, and by the alterations the steamer carries 500 tons more cargo, and has an increased speed of at least a knot and a half. The consumption of fuel was 1.2 lb. per H.P. It was also noticed that the generation of steam at the pressure indicated was comparatively easy, no trouble whatever being experienced in maintaining 198 lb. in the gauge, whilst the engines worked "like a clock." The vessel has also had fitted on board new and powerful refrigerating machinery by Messrs. Haslam, of Derby, which was tried during the run, and found to work admirably. Messrs. J. L. Thompson & Sons, of the North Sands, carried out the whole of the insulation of the holds for the perfect carrying of the carcasses of meat from the River Plate, which trade she is intended for.

### EXPERIMENTAL TANK AT SPEZIA.

IN our issue for April (*vide* p. 26), we called attention to the fact of some delicate machinery having been completed, to the order of the Italian Government, by Messrs. Kelso & Co., of Commerce Street, Glasgow.

We are now desired by Mr. Robert W. Munro, the well-known maker of machinery to the Bank of England, the Home and Foreign Governments, &c., to state that through the kindness

of the Lords of the Admiralty and R. E. Froude, Esq., he was permitted to make a similar plant to that in use in the Admiralty Experimental Works at Gosport, for the Italian Government, with, of course, the exception of the Dynamometer, and two small current meters supplied, as stated in our previous issue, by Messrs. Kelso & Co.; Mr. Munro's contribution to the Spezia tank consisting of the model shaping machine, hauling engine, governor and gear, skinning apparatus, and current meter.

Mr. Munro informs us that he also supplied the boiler, engine, shafting, steel rails which carry the main and current meter, trucks, &c., and in fact the whole plant excepting the dynamometer and two small current meters, as stated before, and the truck which carries the dynamometer, which, he informs us, was constructed at Spezia.

Mr. Munro has also made for Messrs. Denny & Bros., of Dumbarton, a very beautiful and sensitive governor, designed by R. E. Froude, Esq., of Gosport, for the hauling engine of their experimental tank, and which has given every satisfaction.

### TRIAL OF THE ITALIAN ARMOUR-CLAD "RUGGIERO DI LAURIA."

THE full-power trial under forced draught of the Italian armour-clad, *Ruggiero di Lauria*, took place at Spezia on April 29th with most favourable results. The vessel was in charge of Admiral Nicastro, and a Commission appointed by the Minister of Marine was on board to watch the working of the engines and report upon the result. The engines were constructed by Messrs. Maudslay, Sons & Field, of London, and were fitted with Joy's patent valve gear for working the slides, being by far the largest engine to which this type of gear has been applied. A full-speed run was made from Spezia to beyond Genoa and back, and the results were most satisfactory throughout, the engines working splendidly, and giving no trouble whatever, although at times working at over 100 revolutions per minute. The means were as follows:—Pressure of steam in boilers, 80 lb.; revolution of engines, 98; vacuum, 26½ in.; I.H.P., 10,700, the maximum H.P. being over 11,000. The speed realised was 17 knots, with a maximum of 17 6-10th knots, which is rather better than that of *H.M.S. Benbow*, and it must be remembered that the *Ruggiero di Lauria* carries four guns of 110 tons each, whilst the *Benbow* only carries two. After the trial the vessel returned to Spezia to be completed for sea, and will shortly go out for her gun trials.

### THE ENGINES OF THE ITALIAN ARMOUR-CLAD "SICILIA."

CONSIDERABLE enthusiasm has been manifested in Italy over the completion of the engines of 20,000 H.P. for the armour-clad *Sicilia*, now nearly ready for launching in the dockyard at Venice. Representatives of all the principal journals of Italy were present at a gathering held on the 17th May, at the works of Messrs. Ansaldo & Co., at Sampierdarena, where these colossal engines have been constructed under the direction and superintendence of Mr. C. de Grave Sells, Association M.I.C.E. They weigh 1,400 tons, and cost over four millions of francs. The whole of the machinery was made from the designs of Mr. C. Sells, M.I.C.E., M.I.N.A., of the firm of Messrs. Maudslay, Sons & Field, Limited, who has also designed the engines of many other vessels for the Italian Navy, amongst which the *Dandolo*, *Ruggiero di Lauria*, *Andrea Doria*, *Re Umberto*, *Minerva*, and *Liguria* are worthy of mention. The engines were connected to the shop shafting, and were shown in motion to the great admiration and astonishment of the visitors. The boilers, 20 in number, were ranged in order, taking up a considerable space even in the very spacious boiler shop of Messrs. Ansaldo, and it was a subject of wonder how such a quantity of machinery could be got into one vessel, and this is always puzzling to the average landsman, who sees such huge pieces of machinery in a shop, although they do not seem to take up nearly as much space when in place on board. The engines have been con-

structed in little more than two years, and certainly show the immense strides that Italy is making in her manufacturing establishments. The progress made is all the more remarkable when it is remembered that three years ago the works of Messrs. Ansaldo were still in their infancy; although they have been in existence since 1847, when they were established by an Englishman, they were without any experience of such large work.

### ATLANTIC TRAVELLING.

ON her last voyage from Queenstown to Sandy Hook, the Inman and International s.s. *City of Paris* not only beat the record over the whole distance, but also accomplished a better day's run than has ever before been done by an Atlantic liner. Her course took her 2,855 miles. She covered it in 5 days 23 hours 7 minutes, at an average speed of 19.96 miles, her longest day's run being 511 miles. The first regular passenger steamship that ever left Great Britain for America took more than three times as long to do almost exactly the same distance. She was the *Sirius*, of 700 tons burden, and she started from Cork on the 4th of April, 1838, and arrived off New York on the 23rd. Her time and average speed on that voyage, and some of the best times and speeds that have since been made (calculated between Queenstown and Sandy Hook) by other vessels are as follows:—

Ship.	Time.			Average Speed per Hour in Miles
	d.	h.	m.	
<i>Sirius</i> .. ..	18	11	15	6.5
<i>British Queen</i> ..	18	18	10	8.6
<i>Great Western</i> (1) ..	13	6	17	8.9
<i>Liverpool</i> .. ..	11	18	5	10.0
<i>Great Western</i> (2) ..	10	10	15	11.4
<i>City of Richmond</i> ..	7	18	50	15.2
<i>City of Berlin</i> .. ..	7	14	12	15.6
<i>Germanic</i> .. ..	7	11	37	15.9
<i>Britannic</i> .. ..	7	10	53	15.9
<i>Arizona</i> .. ..	7	3	30	16.6
<i>Servia</i> .. ..	6	23	50	16.9
<i>City of Rome</i> .. ..	6	21	4	17.3
<i>Alaska</i> .. ..	6	18	37	17.6
<i>America</i> .. ..	6	14	18	18.0
<i>Oregon</i> .. ..	6	9	51	18.5
<i>Umbria</i> .. ..	6	6	8	19.0
<i>Etruria</i> .. ..	6	1	55	19.5
<i>City of Paris</i> .. ..	5	23	7	19.9

The best passage of the *City of Richmond* was made in 1875; the *Germanic* and *Britannic* did their fastest in 1876; the *City of Berlin's* quickest voyage was in 1877; the records of the *City of Rome*, *Oregon*, and *America* were won in, or before, 1884. We may presently expect to see even the extraordinary record of the *City of Paris* beaten. Steamers have been designed to cover 22 miles (knots) an hour, and there is no reason why, in favourable circumstances, they should not do so. At that rate, and taking the same course as was steered by the *City of Paris*, the distance between Queenstown and Sandy Hook can be done in about 5 days 10 hours; at 23 miles an hour the time would be 5 days 4 hours 10 minutes; at 24 miles just about 5 days; and at 25 miles a little over 4 days 18 hours. Beyond that speed the present generation is not likely to be able to cross the Atlantic.

Progress in this direction has, during the last fifty years, been very great; yet not so great as was once expected. Dr. Dionysius Lardner declared at Dublin, not many months before the *Sirius* was launched, that it was about as feasible to attempt to steam from England to New York, as from London to the moon; but even before he made that ill-advised statement several small paddle-wheel steamers had already attained considerable power and speed. A Hull pleasure steamer, for example, the *Adelaide*, did a distance of 110 miles in 1832 at a rate of very little less than 15 knots. That speed was never exceeded over long distances at sea until about ten or twelve years ago. The highest speed of the *Great Eastern* on her first voyage in 1860 was 14½ knots, and her average speed little more than twelve knots. In that same year the Prince of Wales took twenty-seven days on his voyage home from Portland, Maine, to Plymouth. He was, it is true, on board the *Hero*, a line-of-battle ship of ninety-one guns; but the *Hero* was a screw-ship, and she was supposed to be able to do her 10 knots.

proved incapable of contending with the south-easterly gales which she encountered, and had to be repeatedly taken in tow by her consort, the steam frigate *Ariadne*; but the weather was too much for both ships, and although their coal held out, their provisions did not. On the last few days of the voyage, the royal party had to put up with salted or preserved provisions. Should the Prince ever again go to America, he could probably reach New York in H.M.S. *Blake*, which is now being built, in about six days from Queenstown, or in seven from Portsmouth or Liverpool.

The *City of Paris* reached Liverpool about four o'clock, May 22nd, after completing the fastest eastward passage yet made across the Atlantic. The actual time the *City of Paris* took to perform the voyage from New York to Queenstown was exactly six days and 29 minutes, and her log shows great uniformity in her daily runs, so much so that in the last three full days she only varied five knots. She left New York at 7.38 on the evening of the 15th inst., and up to noon next day had completed 300 knots. To noon on the 17th, 450 knots; 463 knots on the 18th; on the 19th, 471 knots; on the 20th, 470; and on the 21st, 476, which latter was her best day's performance. To 12.42 on the morning of the 22nd, she did 264 knots, making up the total of 2,894 knots. When it is understood that a knot is a statute mile and an eighth, the gigantic nature of the performance can be imagined. The *City of Paris* had 1,182 passengers on board, besides a crew numbering probably between two and three hundred. She can therefore be called the veritable "floating city."

### ANTI-FOULING PAINT.

AN important experiment with anti-fouling paint has been brought to a conclusion with the docking of the Indian troopship *Crocodile* at Portsmouth on her third and final passage from Bombay. It was the custom formerly to dock the Indian troopers at the end of each voyage to India and back for the purpose of inspection and repainting. Subsequently, in consequence of improvements in the nature of the compositions used they were enabled to perform two voyages out and home without docking. More recently, as the inventor of the paints, Colonel Commandant Crease, C.B., Royal Marine Artillery, contended that the three passages to Bombay and back could be performed without the necessity of intermediate docking and repainting, the *Crocodile* was selected by the Admiralty for trial. Her bottom was coated early in September last with one coat of anti-corrosion and one coat of specially prepared anti-fouling paint, and she started on her first trip to India on the 18th of that month. She concluded her third voyage without having been docked in the meantime, on the morning of the 25th ult., each voyage having been made in good time, although during her last trip she suffered, in consequence of an accident in the Canal, an unavoidable delay of a day-and-a-half. By special order from the Admiralty, she was docked on April 26th, with the result that, with the exception of a belt of grass, tapering from 6 ft. wide below her central water-line on the starboard side, and a little more on the port side, to nothing at all at the extremities, her entire bottom was perfectly clean, being free from weeds, barnacles, and other incrustation, and also quite protected in every part. This excellent result, obtained with a single coating of anti-fouling composition, has been pronounced by the dockyard authorities and the experts sent specially down to inspect the ship from the Admiralty, to be the most satisfactory hitherto obtained. It was remarked that the fine grass on the *Crocodile's* bottom only grew where she had been scrubbed with brushes by her ship's company, and where, it is assumed, the skin had been denuded of paint.

### IMPROVED PATENT SKYLIGHT FOR ENGINE-ROOMS, &c.

MR. JOHN MASON has devised and patented an improved skylight for engine-rooms and ships' or any portions of a vessel lighted from the which we consider deserving of notice.

There has long been a great need for improvement in the constructive details of engine skylights and similar deck erections. In the case of the former, how frequently have breakages—of hinges and rods for holding the shutters open—occurred; and leakages from skylights, be they merely for light, or for light and ventilation, are of frequent occurrence.



Fig. 1.

It has always been a problem difficult, if not impossible, of solution how so to combine the use of wood, iron and glass, that watertightness should be guaranteed. Now, in all these respects Mr. John Mason's Improved Patent Skylights appear to be a



Fig. 2.

solution of the difficulties. With them iron alone, along with glass, can be used with satisfaction in every respect. We have pleasure in illustrating and describing this new departure. In fig. 1 will be seen

a side view of the flap and frame of one of Mason's skylights, the flap being shown open. Fig. 2 is an external view of the skylight closed, and Fig. 3 a front view of the open skylight.

At a glance it will be observed that instead of the hinges being placed at one extremity of the flaps, they are placed about mid-length, so that the flaps are practically balanced. This arrangement, together with minor details, ensures a considerable decrease in the liability of the glasses to breakage, and as the frames and flaps are constructed of the best malleable cast iron failure on their part is entirely obviated.

The watertightness of the Improved Patent Skylight is secured by the adoption of a V groove in the frames fitted with Cresswell's Patent Anti-Friction Packing that will withstand all climates, the flap being correspondingly fitted with a V projection, on the same principle as has been adopted in the most approved watertight doors for bulkheads. Special care has also been taken to prevent any leakage through the



Fig. 3.

hinges (which are constructed in only two parts) at the joint, one part being fixed to the flap, and the other to the frame. An outlet groove on the outside edge of the hinge, under the pin, is provided to carry off any leakage that might otherwise pass through the joint.

The patentee points out that the merits of his Improved Patent Skylight as a perfect ventilator are obvious; a current of air entering the lower half, forcing the heated air or steam to ascend out of the top half, thus precluding any direct draught. There is thus every reason to anticipate that these skylights will be largely adopted for all parts of passenger vessels, as hitherto ordinary cowl ventilators have often been introduced along with skylights having fixed tops, on account of the difficulty of regulating ventilation and of securing watertightness, with ordinary opening and closing skylights.

It should also be pointed out that in Mason's Improved Patent Skylights the flaps are absolutely re-

versible, and are also readily removed from their frames, leaving the latter intact; a very advantageous arrangement in instances where articles of bulk have to be lowered into the engine room.

At present the size of skylight being manufactured is 3 ft. 1 in. by 2 ft. outside measure, the opening being 2 ft. 8 in. by 1 ft. 8 in., the flaps being fitted with two circular lights of plate glass 8 in., 9 in., or 10 in. diameter. The skylights can, however, be made to any size that may be required.

It may be pointed out that Mr. Mason, the patentee, has also devised an arrangement for the simultaneous opening and closing of the whole of the flaps of large skylights, which, owing to the flaps made according to his patent being balanced, is a work of comparative ease. This feature renders these skylights specially suitable for long alley-ways or passages on mail or passenger vessels, when the maximum of air is frequently required.

Although it is only recently that the manufacture of Mason's Improved Patent Skylights was commenced by Mr. William Exley, Malleable Iron Founder, Guy Croft Works, Otley, Yorkshire, who is the sole maker, already a large number of orders have been received, Tyne, Tees and Hartlepool shipbuilders of the highest standing, being prominent amongst the first purchasers.

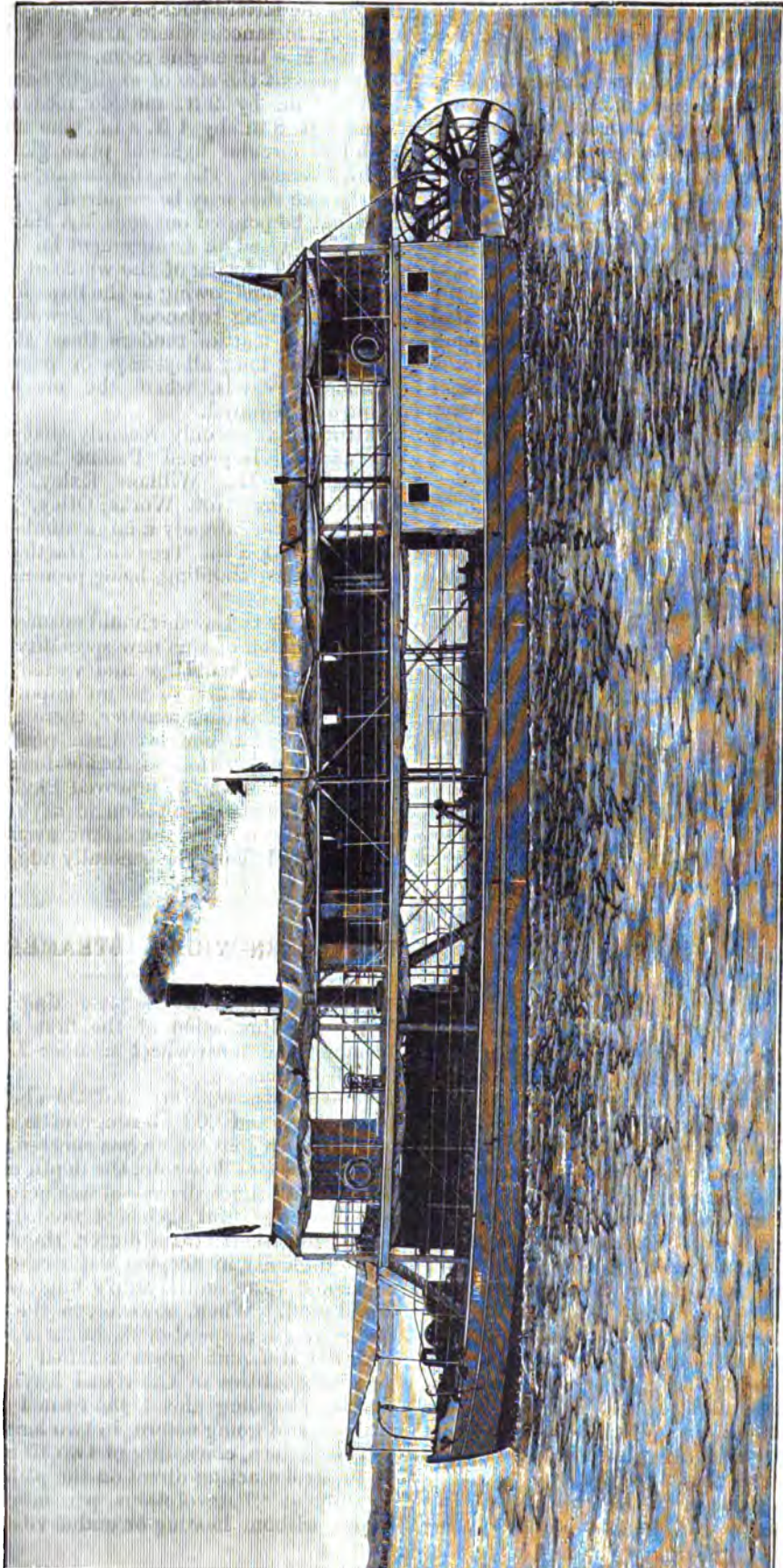
This latter fact alone should ensure a rapid and universal adoption of this new speciality, as when sound, practical men, of large and varied experience, pronounce a departure to be an important advance on present day ordinary practice, there remains no room for doubt. Further, we have placed each of our readers in a position to decide for themselves, as to the value of Mason's Improved Skylights. For ourselves we have no hesitation in saying that they are undoubtedly a very important acquisition to shipbuilders, and should be generally adopted.

## THE STERN-WHEEL STEAMER "LAO-KAY."

WE have pleasure in presenting our readers with an illustration of the first steamer built in Tonquin, the stern-wheel steamer *Lao-Kay* enjoying that distinction.

Built by Messrs. Marty & d'Abbadie, the *Lao-Kay* is 105 ft. long and 20 ft. beam, and is the first steamer of her dimensions which has succeeded in passing the Son-tam-bac at low tide, the depth of water being so little that at times the vessel was actually walking her wheel over several inches of mud, leaving traces on either side like a steam digger, the engineers having great difficulty in keeping water in the boiler, as the cocks and roses on the ship's bilge were immersed in liquid mud. When, however, in the river and fairly under weigh, a speed of  $9\frac{1}{2}$  knots was easily kept up, and the different posts reached in due time, the steering qualities of the vessel leaving nothing to be desired, as, going ahead, she turned in one-and-a-half lengths, and going astern, in two lengths.

The engines, consisting of two 10 in. cylinders with 36 in. stroke, acting direct on the paddle shaft, worked steadily at 27 revolutions per minute with 80 lb. steam, without heating or undue vibration. The fee



THE STERN-WHEEL STEAMER "LAO-KAY."

pumps and slide rods are worked off eccentrics on the shaft, the exhaust being fed direct to a galvanised steel feed heater specially designed by Mr. W. C. Jack, the superintendent engineer, for this system of engine, the feed water being pumped into the boiler at 200 degs. Fah. Little loss of water occurs, as a portion of the exhaust steam is condensed by coming in contact with a jet of cold water on entering the heater, the waste vapour causing at the same time a strong draught in the funnel. The boiler is of the modified locomotive system, constructed in the workshops of the company at Haiphong, and is of Siemens-Martin steel, from the Steel Co. of Scotland, tested to 180 lb. per square in. The consumption of coal is about 2½ tons per 24 hours.

The *Lao-Kay* is fitted with every comfort and convenience for passengers. The saloon and cabins are heated by steam tubes, the cold in the high delta of Tonquin being, in the cold season, intense. In front of the saloon, and immediately behind the steering gear, is a large space for a promenade, greatly appreciated by the passengers, the usual bullet shields being fitted on the sides as a protection against piratical attacks, the stoke-hold and engine-room being protected in the same manner by steel plates. The vessel has ample space amidships for horses and troops, while the cargo space is very large for a boat of her size, the registered tonnage by the Government being a trifle over 80 tons.

Two composite boats of the same class, 135 ft. long by 24 ft. beam, are on order at the workshops of Messrs. Marty and d'Abbadie, for their service, the necessity of having very light draught steamers in these rivers becoming a *sine quâ non*. The new steamers will be built to draw 22 in. and to steam 11 knots.

By the aid of the *Lao-Kay*, and their other light draught steamers, the Messageries Fluviales Co. hope to prove that the Red River, as a water way, is open to Yunnan. The *Lao-Kay*, having already gone higher than any point reached by the light draught gunboats during the war, and that, too, on a trial when the water was at its lowest. Her owners are confident that when the water rises the ancient border citadel of Lao-Kay will be reached.

The company has now 21 steamers, and the number of passengers and quantity of produce carried has increased within the past year to an enormous extent. The workshops and shipyards of the company cover a large area on the banks of the Gue Cam, at Haiphong, and are fully occupied in the construction and repairs of river steamers and steam launches.

The company have already opened the following regular lines:—Bachat to Tuyen-quan, by the White River; to Than-quan, by the Red River; and to Cho-bo, by the Black River.

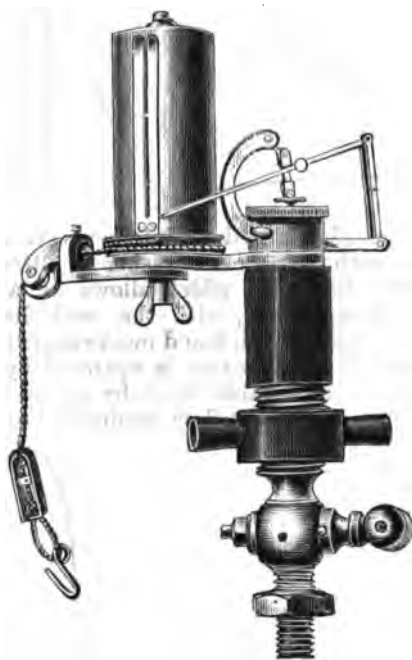
A model of the *Lao-Kay*, with other exhibits of the company, is to be seen at the Paris Exhibition.

Messrs. WILLIAM SIMONS & Co., Renfrew, have received an order from the Board of Trade to construct one of their patent hopper dredgers, to be employed in connection with the improvement of Ramsgate Harbour. The new vessel is to be similar to the hopper dredger *St. George*, which the above firm supplied to the Admiralty, and which is presently employed at Portsmouth Dockyard.

## T. S. McINNES' PATENT ENGINE INDICATOR.

THE steam-engine indicator, forming the subject of the accompanying illustrations, is the invention of Mr. T. S. McInnes, of Messrs. McInnes & Cairns, of 56, Waterloo Street, Glasgow; and though it is, comparatively speaking, of recent introduction, it is already extensively in use, both for marine and land engines, and has been favourably reported upon by all who have experimented with it, including some of the best known engineering experts.

The aim of the inventor has been the production of an instrument which should be thoroughly reliable at all pressures and speeds, and at the same time capable of giving steady full-sized diagrams. All other high-speed indicators only allow diagrams of about 1½ in. high and 2½ in. long, which limitation renders them of comparatively small utility when used for slower speed engines. The T. S. McInnes Indicator can, if desired,



give a card 5 in. long by 3 in. high, and this without oscillation sufficient to cause perceptible distortion of the diagram, up to at least 400 revolutions per minute. It may therefore be used with equally good results for the main engines of a steamer, and for the numerous high-speed auxiliary engines which always form part of the equipment of first-class modern steamships. The necessity for having separate sets of low and high-speed indicators is thus done away with.

One of the principal features of novelty in this indicator is the arrangement of the parallel motion, which combines the two very desirable qualities of lightness and stiffness, and is at the same time of such a nature that its momentum is checked by the action of its component members. The cylinder, cylinder cover, and coupling ring are sheathed with vulcanite, an arrangement which enables the instrument to be handled and springs changed with comfort, even while working with the highest pressure of steam.

The indicator cylinder is made open at the bottom to allow of its being easily cleaned, and a removable

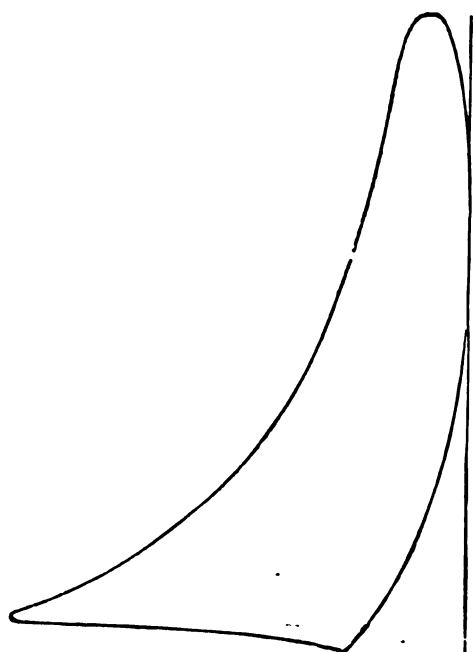


Diagram taken by T. S. McInnes' Patent Indicator, from an Engine (Gas) tested by Professor Jamieson, on the 9th March, 1889.

Revolutions, 180 per Minute; Scale,  $\frac{1}{8}$  to the inch.

wire-gauze guard is fitted to intercept grit and dirt. A jam nut with an asbestos washer is fitted on the screw of the stop cock, which allows of a steam-tight joint being made, with the cock handle in whatever position may be found most convenient.

The drum of the indicator is operated by a spiral spring with an adjustable head, by means of which its tension may be increased or diminished to suit the

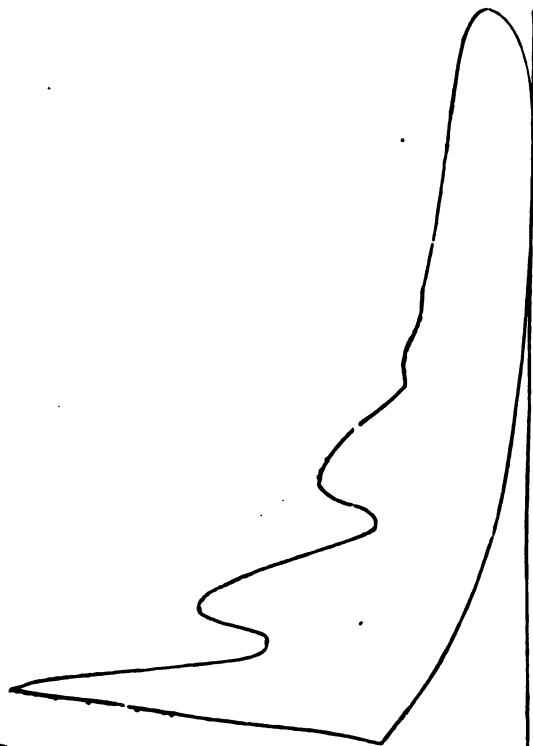


Diagram from same Engine, taken with Richards' Indicator.

Revolutions, 180 per Minute; Scale,  $\frac{1}{8}$  to the inch.

speed of the engine; and a revolving pulley stud allows of the lead being carried away at any angle. The lead-cord is supplied with a highly-ingenious clip cord adjuster, by merely pressing the ends of which the cord may be instantaneously shortened or lengthened; and to obviate the delays and annoyance so frequently caused by the stretching of ordinary cords in cases where long leads are required, Messrs. T. S. McInnes & Cairns supply a patent six-strand steel wire cord, covered with double linen tube, which, though perfectly flexible, is absolutely without stretch.

The pressure of the pencil on the drum is adjustable to a nicety by a screw, with milled head, attached to the upper part of the indicator cylinder, and, as the end of the pencil arm is free to move laterally to any inequality of the paper, diagrams having uniformly fine lines are obtained.

Such eminent authorities as Professor Kennedy, of University College, London, and Professor Smith, of Birmingham, have tested the T. S. McInnes Indicator on various types of steam-engines with excellent results; and Professor Jamieson, of Glasgow, has given emphatic testimony to its superiority for indicating gas-engines, which is, perhaps, the severest test applicable to instruments of this description. The two diagrams which we reproduce were taken by Professor Jamieson from the same gas-engine by T. S. McInnes' and Richards' Indicator respectively, in March of the present year, and they may safely be left to speak for themselves.

It may be stated that the T. S. McInnes Indicator has been extensively adopted by engineering and ship-owning firms on the Clyde and other shipping centres, and that such firms as Messrs. Denny & Co., Messrs. A. & J. Inglis, Messrs. Laird Bros., Messrs. The Palmer Shipbuilding Co., and the Wallsend Slipway and Engineering Co., have made exhaustive trials with the indicator, and testified their high approval of its merits by complimentary letters and repeat orders.

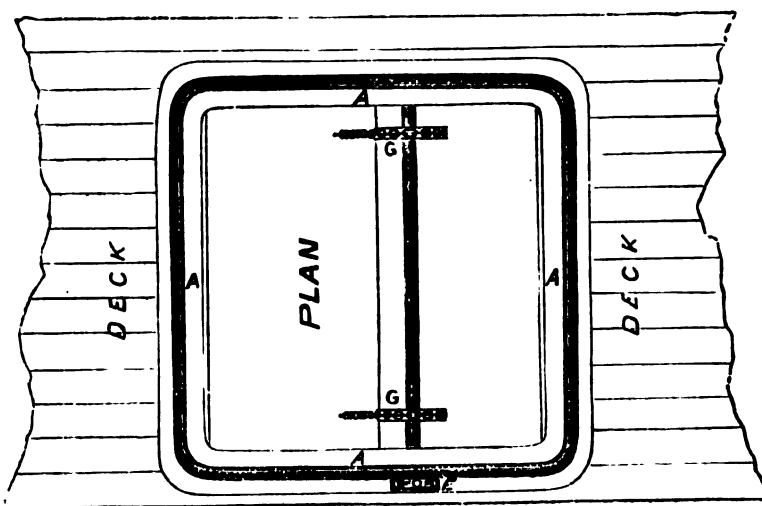
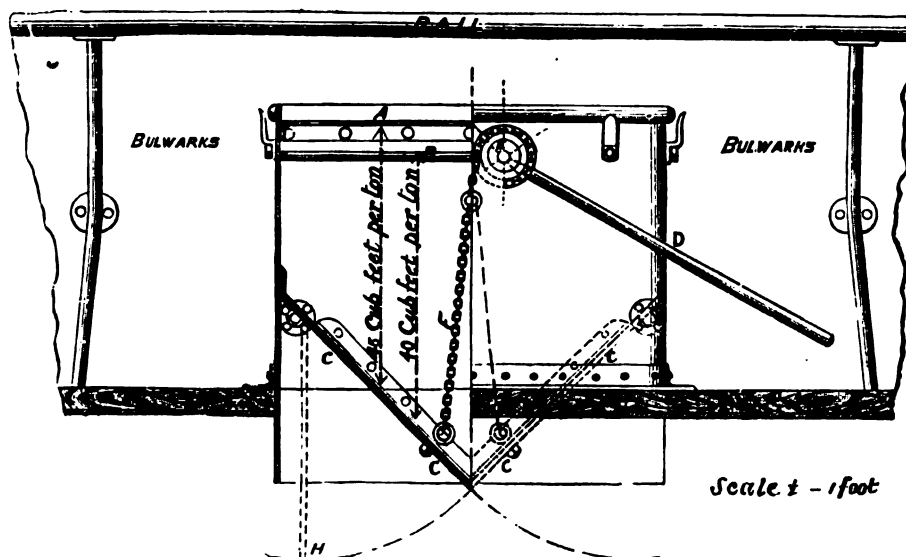
### WADE & PATERSON'S PATENT COMBINED BUNKER, HATCH AND COAL MEASURE.

THE accompanying illustrations represent an ingenious piece of mechanism, designed by Messrs. Wade & Paterson, of 32, Rudyard Street, North Shields, for the purpose of preventing short weight being put on board vessels when taking in bunker coals, an advantage, which we have no doubt, will be fully appreciated by our readers, and more especially by those having to coal frequently in foreign ports, where prices run very high, and where, consequently, it is of the utmost importance to see that the full weight paid for is delivered. Not only does this system ensure full weight being received, but by its aid the unavoidable loss of time for coaling is very much curtailed, the cost of fitting the system being trifling when compared with the time gained, to say nothing of the considerable saving in the cash expenditure for fuel.

From the illustrations it will be seen that the apparatus is extremely simple, and as it is very strongly made, and has only three moving parts, there is no likelihood of its getting out of order.

When the doors, C, are closed and the receiver is filled to the top of the angle iron, A, the capacity equals 45 cubic feet, or the amount allowed for Newcastle coal, while similarly, when filled only to the top of the half round beading, B, the capacity is only 40 cubic feet, or the equivalent of Welsh coal. It will be understood that though described as in English tons, the receiver may be constructed to hold any

From this necessarily brief description it will be seen that the patentees have placed before the public a valuable addition to the fittings of a ship, and we think that all owners, and those about to place orders for new ships, would be well advised were they to see that at least one of these time and money saving appliances were placed on board and given a fair trial, and were this done we venture to predict that the cost



desired number of hundredweights, or it may be graded to any foreign measurement as required.

When an open hatch is required, it is only necessary to adjust the lever, D, so that the bridle chains, F, passing over the pulleys, G G, allow the doors, C C, to hang in the position shown in dotted line at H, the pulleys, G G, being mounted on the spindle to which the small turning wheel, E, is keyed.

The doors may be made so that they will not come below the deck line, and they may be made self-closing if desired.

would be considerably more than recouped in the first year.

### SERVE'S PATENT RIBBED TUBES.

THE departures in practice of recent years, both in general design and construction, as well as in minor details, sometimes apparently of little moment, alike in naval architecture, marine engineering, and boiler-making, are extremely signi-

## COMPARA

Made by the French Admiralty, at Brest, in November and December, 1888,

Sequence of Trials	Draft Depression in Smoke Box.	Coal for getting up Steam.	Time required for getting up Pressure.	Coal used for the Trial.	Duration of Trial.	Water Evaporated during Trial.	Coal burnt per square foot of Grate Surface per hour.	Water Evaporated per pound of Coal.	Water Evaporated per hour and square foot of Grate Surface.	Water Evaporated per hour and square foot of Heating Surface.	Te
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## PLAIN TUB

1st day.	Natural $\frac{1}{4}$ "	298 lbs.	41 minutes	1104 lbs.	3h. 26m.	985 galls.	22.01 lbs.	0.892 gall.	19.66 gall.	0.765 gall.	6
2nd "	" $\frac{1}{4}$ "	298 "	43 "	1104 "	3h. 19m.	981 $\frac{1}{2}$ "	22.79 "	0.889 "	20.29 "	0.789 "	6

## PLAIN TUB

1st day.	$\frac{17}{32}$ " water	298 lbs.	42 minutes	3312 lbs.	4h. 16m.	2624 gall.	53.15 lbs.	0.793 galls.	42.16 gall.	1.64 gall.	10
2nd "	$\frac{13}{16}$ " "	298 "	38 "	2980 "	4h. 4m.	2353 "	50.19 "	0.789 "	39.65 "	1.54 "	4
3rd "	1" "	298 "	42 "	2760 "	4h. 13m.	2169 "	44.82 "	0.785 "	35.25 "	1.37 "	4
4th "	$\frac{25}{32}$ " "	298 "	41 "	2539 "	4h. 1m.	2057 "	43.28 "	0.810 "	35.11 "	1.36 "	4

## "SERVE'S" RIB

1st day.	natural $\frac{3}{16}$ " full	298 lbs.	43 minutes	1104 lbs.	3h. 57m.	1123 $\frac{1}{2}$ gall.	19.13 lbs.	1.016 gall.	19.49 gall.	0.759 gall.	8
2nd "	" $\frac{3}{16}$ " "	298 "	44 "	1104 "	3h. 45m.	1134 $\frac{1}{2}$ "	20.16 "	1.028 "	20.73 "	0.807 "	4

## "SERVE'S" RI

1st day.	$\frac{17}{32}$ " water	298 lbs.	36 minutes	3312 lbs.	4h. 22m.	3076 gall.	51.93 lbs.	0.929 gall.	48.27 gall.	1.88 gall.	7
2nd "	$\frac{13}{16}$ " "	298 "	40 "	2980 "	4h. 27m.	2834 "	45.86 "	0.951 "	43.64 "	1.69 "	7
3rd "	1" "	298 "	41 "	2760 "	4h. 35m.	2650 "	41.23 "	0.960 "	39.61 "	1.54 "	6
4th "	$\frac{25}{32}$ " "	298 "	37 "	2539 "	4h. 30m.	2464 "	38.63 "	0.970 "	37.54 "	1.46 "	6

He would, however, be a bold man who affirmed that the end of these departures had been reached, or that only immaterial benefits were yet remaining to be reaped.

In boiler-making, especially, important departures may yet be anticipated. The adoption of high pressures since the introduction of triple-expansion engines and the extended use of forced draught have not been unaccompanied in the past with important alterations of details, *e.g.*, furnace flues are now generally corrugated or ribbed. Other deviations from present practice are, however, to be expected; and in one particular—viz., the tubes of marine boilers—what appears to be a manifest and decided improvement will soon be, if it be not already, *un fait accompli*.

For some years past the question of utilising to a larger extent the heating surface derived from the tubes of the marine boiler has been a problem. It has exercised many, but hitherto without any success. Amongst the number is Monsieur Serve, who, more fortunate, as, after his trials, he has adopted the device of increasing the heating area of boiler tubes, without

increasing their diameter, as the solution to the problem. This he accomplishes by introducing a number of ribs into the interior of what is otherwise an ordinary boiler tube. As will be seen by our illustration of a full-sized section of a tube  $2\frac{1}{2}$  in. external diameter, in that particular size he places eight ribs. Incidentally, it is also claimed for this arrangement that greater strength is secured, although in Purvis' ribbed furnace flues, the Farnley, spirally corrugated, and Fox's original corrugated flues, increased resistance to high pressures was the *beau ideal*.

It is upwards of two years since M. Serve came to the conclusion he had hit upon the right mode of increasing the efficiency of marine and other boiler tubes, and for fully that period Serve's Patent Ribbed Tubes have been constantly used with advantage and without any inconvenience in the boiler of a steamer trading between Lyons and the Mediterranean.

To render assurance doubly sure, and to satisfy the French Admiralty of the importance of his invention, M. Serve has been fortunate enough as to have exhaustive comparative trials made at Brest, by the French Admiralty, in November and December, 1888,

## TRIALS

Ordinary Brass "PLAIN" Tubes and Brass "SERVE'S" Patent Ribbed Tubes.

Average Temperature at top of Smoke Box, measured by Richard Bros' Inco Gas Thermometer.	Ashes after Trial.	Clinkers after Trial.	Coke after Trial.	Soot in Smoke Box.	Soot in Tubes.	Temperature of Feeding Water.	Temperature of the Atmosphere.	Atmospheric Pressure.	Direction and Force of Wind.	Pressure of Boiler
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## NATURAL DRAFT.

56° Fahr.	63 lbs.	31 lbs.	16½ lbs.	Total (3½ lbs.)	—	48° Fahr.	51° Fahr.	29½" mercury	W.S.W.	5½" mercury
54° "	77 "	24½ "	18 "	3½ "	—	49° "	48° "	29½" "	W.N.W. Slight	5½" "

## FORCED DRAFT.

Boiler damaged	140 lbs.	53 lbs.	13½ lbs.	5½ lbs.	2½ lbs.	53° Fahr.	50° Fahr.	30" mercury	W.N.W. Slight	5½" mercury
56° Fahr.	142½ "	44 "	15½ "	5½ "	1½ "	50° "	55° "	30" "	S. Stiff Breeze	5½" mercury
56° "	148½ "	47½ "	18½ "	4½ "	1½ "	50° "	57° "	30½" "	S.S.W. Slight	5½" mercury
55° "	139½ "	42½ "	16 "	4½ "	1½ "	50° "	57° "	30½" "	S. Stiff Breeze	5½" mercury

## TUBES WITH NATURAL DRAFT.

56° Fahr.	56 lbs.	37½ lbs.	19 lbs.	Total (5 lbs.)	—	50° Fahr.	57° Fahr.	29½" mercury	S.E. Slight	5½" mercury
56° "	70½ "	28½ "	16½ "	4½ "	—	50° "	55° "	30" "	S. Stiff Breeze	5½" "

## TUBES WITH FORCED DRAFT.

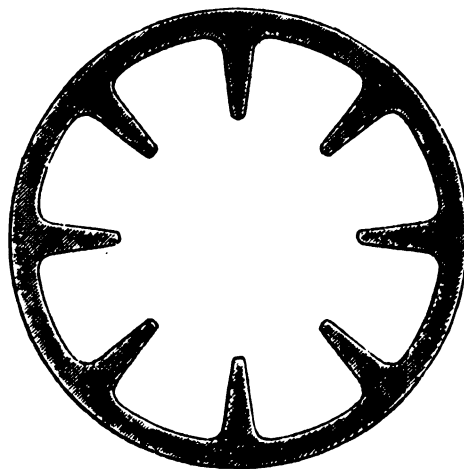
56° Fahr.	154 lbs.	40½ lbs.	12½ lbs.	7½ lbs.	1½ lbs.	54° Fahr.	59° Fahr.	30½" mercury	S.W. Slight Breeze	5½" mercury
56° "	153½ "	44 "	14½ "	5½ "	1½ "	52° "	59° "	30½" "	W. "	5½" "
56° "	146½ "	34½ "	14 "	6 "	½ "	52° "	57° "	30½" "	W. "	5½" "
56° "	127½ "	52½ "	15½ "	6 "	½ "	57° "	55° "	30½" "	W. "	5½" "

between ordinary brass "Plain" tubes and brass "Serve's" Patent Ribbed Tubes. As we believe these tests will be of interest to our readers, we have pleasure in giving the particulars in full in the annexed Table I.

It will be seen that great care has been exercised in carrying out the trials. All necessary particulars are given by which the relative importance of the two types of tubes can be accurately gauged—and evidently both sets of trials were carried out under practically similar circumstances. It, therefore, follows that the results deducible will be fairly trustworthy; and, taking as the basis of comparison the quantity of water evaporated per 1 lb. of coal, the following saving of fuel is demonstrated:—

First day, with natural draft	13.9%	Average say
Second day " "	15.6%	
First day, with forced draft at 1½" depression	17.2%	Average say
Second day, " "	20.4%	
Third day, " "	22.0%	
Fourth day, " "	19.8%	

The coal used was the same throughout, carc-



fully weighed, and the water exactly measured. The boiler, with which the comparative trials

carried out, has a total heating surface of 375 square feet—the tubes in each instance being 64 in number; 6 ft. 7½ in. in length; 3 in. in outside diameter. The grate surface was uniformly 14 ft. 6 in., the fire-grate bars being 1 in. thick, ½ in. apart, in three lengths. The height of the chimney was 40 ft. 8 in., and its diameter 18½ in.

These facts having all been placed before Messrs. John Brown & Co., Limited, Atlas Works, Sheffield, and careful investigation made by them as to the continuous working of the Serve tubes on board the steamer plying between Lyons and the Mediterranean—this well-known company resolved to acquire the sole right to the production of the Serve tubes in Great Britain and the Colonies. In this they have been successful, and have already laid down special plant and machinery for the construction of this new speciality either in brass, copper, iron, or steel. At first, the size of tubes that are being manufactured are 3 in. in diameter, but at an early date any size of "Serve" tubes will be procurable, and as they have been approved by the Committee of Lloyd's Register and the Board of Trade, it will not be surprising if in a brief period the Patent Ribbed Tubes are in general demand.

Especially does the "Serve" tube appear to be advantageous when forced instead of natural draught is used, and it is considered that this feature will quickly lead to the general adoption and effective use of forced draught. Of late there has not been, so far as we can glean, very many steamers built or fitted with forced draught arrangements. Some impetus has apparently been lacking, or more possibly, as has partially transpired, there has been difficulties owing to the higher temperature of the gases evolved in combustion. In this aspect it is important to note that the results obtained in the comparative trials already described, show an average reduction of heat in the smoke box and funnel of fully 200° Fahr. with natural draught, and 300° Fahr. with forced draught. The greater reduction in the latter instance is specially noteworthy. It is evident that the ribs of the Serve tubes do absorb heat, and communicate to the circumference of the tube, and thus to the water, or how otherwise is there increased steam generation and decreased heat in the smoke box and funnel!

Before the trials were carried out, it was the opinion of experts of the French Admiralty that the time occupied in getting up steam would be greater with the Serve than with the plain tubes, but this was falsified. Another apparently plausible point, in relation to these ribbed tubes, was that they would be more difficult to clean—but this, too, is not found to be the case in practice—an ordinary wire brush being found thoroughly efficient—while for extraordinary cases a special scraper, to suit the ribs, could readily be employed.

So confident are the advisers of Messrs. John Brown & Co., Limited, Atlas Works, Sheffield, of the decided advantages of the Serve tube, that they affirm that in steamships now using natural draught double the quantity of steam can be generated, or one-half the boilers removed by substituting the Serve tubes and forced draught. Similarly in vessels already having natural draught, 20 per cent. additional steam

may be generated with the same fuel, or the number of boilers reduced proportionately; or, if it were preferred, and the engines admitted of the utilisation of a greater quantity of steam, the speed of the steamer could be increased.

The British Admiralty have this new speciality under consideration, and already its adoption in mercantile steamers has been favourably entertained. In all improvements resulting in decreased consumption of coal, there is always the permanent advantage of reduced weight, both of boilers and of water, and of bunker coals, with the corollary advantage of increased freight-earning capabilities; and these items naturally are carefully considered by those interested in merchant shipping. Having placed all available data on the subject before our readers, they will be able to draw their own conclusions.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from April 25th to May 24th, 1889.

- Aborn, Geo., chief engineer to the *Hibernia*, additional, to date April 30th.
- Alliden, Frank A., assistant engineer to the *Ruby*, to date May 22nd.
- Anderson, Robt., fleet engineer to the *Agincourt*, to date May 24th.
- Ball, Ralph H. C., assistant engineer to the *Colossus*, to date April 30th.
- Bolt, Charles W. (probationary), assistant engineer to the *Anson*, to date May 28th.
- Carey, John J., engineer to the *Inflexible*, to date May 4th.
- Chase, John E., chief engineer to the *Himalaya*, to date April 29th.
- Dawe, Chas., chief engineer to the *Pandora*, to date May 6th.
- Durston, Albert J., inspector of machinery, to be engineer-in-chief at the Admiralty, vice Mr. Sennett, resigned.
- Ellis, Wm. A., acting chief engineer to the *Seahorse*, to date April 29th.
- Evans, Henry A., engineer to the *Anson*, to date May 28th.
- Fielder, John, engineer to the *Barracouta*, to date May 16th.
- Grant, David, fleet engineer to the *Northampton*, to date May 16th.
- Greetham, Chas. T. D., acting assistant engineer to the *Orontes*, to date May 14th.
- Hill, Chas. H. (probationary), assistant engineer to the *Anson*, to date May 28th.
- Hole, John W., engineer to the *Whiting*, to date April 27th.
- Jolliffe, Henry, chief engineer to the *Vulcan*, to date April 29th.
- Jones, John, engineer to the *Curlew*, to date May 6th.
- London, Arthur J., engineer to the *Landrill*, to date April 30th.
- Main, Reuben (probationary), assistant engineer to the *Tamar*, to date May 14.
- M'Avoy, Wm. R., fleet engineer to the *Ruby*, to date May 22nd.
- Meiklejohn, H. J. (probationary), assistant engineer to the *Anson*, to date May 28th.
- Nelson, Jas., fleet engineer to the *Hydra*, to date May 22nd.
- Nicklin, Wm., staff engineer to the *Asia*, additional, to date April 27th.
- Osborne, Chas. E. H., acting assistant engineer to the *Phaeton*, to date April 30th.
- Palmer, Alfred, chief engineer to the *Indus*, additional, to date May 16th.
- Pellow, Chas. H., chief engineer to the *Vernon*, additional, for service at Woolwich, to date April 30th.
- Pibworth, Wm. H., chief engineer to the *Basilisk*, to date May 16th.
- Pippett, Wm. H., engineer to the *Indus*, additional, to date April 27th.
- Purvis, Alex., fleet engineer to the *Anson*, to date May 28th.
- Rabidge, Wm., chief engineer to the *President*, additional, to date May 6th.

Sanders, W. C. (probationary), assistant engineer to the *Anson*, to date May 28th.  
 Sercombe, Francis J. (probationary), assistant engineer to the *Camperdown*, to date May 13th.  
 Shoobread, Adam, staff engineer to the *Ruby*, to date May 16th.  
 Stephens, Lindsay J. (probationary), assistant engineer to the *Victoria*, to date May 14th.  
 Straw, Alf. E., acting assistant engineer to the *Himalaya*, to date May 14th.  
 Stuart, Jas. J., engineer to the *Phoenix*, to date May 9th.  
 Thomas, Josiah P., chief engineer to the *Thunderer*, to date May 27th.  
 Turner, Joseph, fleet engineer to the *Alexandria*, to date June 8th.  
 White, Geo., chief engineer to the *Vernon*, additional, for service at Woolwich, to date April 30th.  
 White, Wm. W., engineer to the *Scout*, to date April 30th.

## HOAR & BROWN'S HARDWOOD MARKET REPORT, May 24th, 1889.

**TEAK.**—Prices remain unchanged. The deliveries at the beginning of this month showed a considerable falling off, owing no doubt to the Easter holidays, but since then they have increased to the level of former figures. Some large business has been transacted by dealers, though at rather fine profit, in consequence of close competition with shippers, who are very anxious to edge in and secure the business. The market is now fairly well provided with stock, and the Moulmein shipments expected very shortly will make a great show, but the principal portion is allotted to forward contracts, and will leave the docks almost immediately. Two Bangkok cargoes have arrived lately, one of which is under an engagement that will take most of the cargo to fulfil, thus leaving the market in a somewhat better position than appearances would otherwise indicate.

Long planks are much in demand, and stocks continue short.

The deliveries for the last 4 weeks were	815 Loads.
" " " 4 months ending Apl., '89,	5059 "
" " " " " " '88,	6143 "
" " " " " " '87,	3283 "
The stocks on the 1st May, 1889, were	{ 3,332 Lds. Logs.
	{ 1,112 " Planks.
Against in 1888.. .. .	{ 7,558 " Logs.
	{ 583 " Planks.
Against in 1887.. .. .	{ 11,514 " Logs.
	{ 1,424 " Planks.

**GREENHEART.**—The stock is very small, and little business doing.

**MAROGANY.**—Honduras and Mexican. A large stock has been thrown upon the market during the last month, which has found ready buyers, and there only remains a small supply of really good quality wood in first hands now in the docks. Good panel logs have commanded a high price, and are still greatly in demand. Cuba has been stacked lately rather largely, but during the last week has moved off, owing to the price, size for size, being lower than either of the above-named descriptions.

**WHITEWOOD.**—Planks and boards are finding willing buyers at fair prices remunerative to shippers, but logs forced at public sale, without reserve, realized poor prices.

**CANAL.**—Panel logs are wanted, and there is a small demand for general sizes. Stocks are very light, and there is little or no wood in first hands.

the yards on both sides of the upper and lower reaches of the river Clyde. The class of workmen disaffected are the rivetters, and here and there the caulkers, who follow the rivetters in the process of shipbuilding work. The strike began about the 20th of the month, and the negotiations which have been entered into from time to time between employers and employed, have resulted in nothing approaching a settlement. The demands of the workmen involve an increase upon various classes of work ranging from 30 per cent. down to 5 per cent., the average being somewhere about 15 per cent. The strike is solely at the instance of piece-work rivetters, with the object of obtaining an adjustment of piece-work rates, more especially as regards inside work. The rivetters express great indignation at a statement to the effect that the average earnings of squads of rivetters were £19 per fortnight. They deny the truth of the statement, and allege that it has been published to damage them in the eyes of the public. They do not deny that a strong, capable squad can earn a fair wage when employed upon the *shell* of a ship; but they allege that at some *inside* jobs it is impossible to earn more than a bare livelihood, and at others not even that. Generally speaking, they allege that their present demand is for a re-adjustment of prices so as to bring the prices for inside work up to something proportionate to the present prices for the shell.

The men in the whole of the Clyde shipyards, with the exception of those at Dumbarton and Clydebank—in which places the scale of rates is somewhat more liberal than elsewhere—are at one in the movement, and between 3,000 and 4,000 men are affected. The strikers have the support of the Association of Boilermakers and Shipbuilders, and it is thought probable that the army of strikers will soon be swelled by the caulkers and fitters, should a compromise or settlement not meanwhile be arrived at.

With these wages troubles on their hands, it is with but half-hearted satisfaction that the shipbuilders and engineers of the Clyde have received, in common with those in other centres, the Admiralty's invitation to tender for the construction of protected cruisers and other vessels of war, forming part of the extensive programme recently laid down for the extension of the Navy. The offers are invited to be sent in before June 20th, a date when surely the strike shall have been settled and forgotten. Over twenty of the larger firms throughout the kingdom have been asked to tender, and, as builders are asked to offer for only three, or a lesser number, of vessels, the work will probably be well distributed over the country. Clyde builders, however, are hopeful that a large proportion of the work will come their way.

Wages troubles notwithstanding, the month of May has been one of the most prolific in launches the industry has experienced for a considerable time, and the aggregate output will not fall far short of 33,000 tons. The most important of the new vessels put into the water during the month was the *Magdalena*, built by Messrs. Robert Napier & Sons for the Royal Mail Steam Packet Co., London. The *Magdalena* is the second of four steamers built and building for this company by Messrs. Napier, the first being the *Atrato*, finished some months ago. The vessels are each 430 ft. long, 50 ft. beam, and 33 ft. 4 in. deep to spare deck, while their tonnage is about 5,300 tons.

Cross-river communication at the lower end of the harbour of Glasgow—a long-debated subject—is about to realise at least partial or temporary solution, in the shape of an elevating vehicular and passenger ferry steamer, designed by Messrs. Simons & Co., Renfrew, which the Clyde Trust have, after much consideration, decided to adopt. Messrs. Simons are being instructed to proceed with the vessel, which, from all accounts, should when completed, prove an efficient link of communication between the north and south sides of Glasgow Harbour. The vessel is to be about 70 ft. long and 43 ft. broad. The lines of bow and stern are to be alike, and there are to be two propellers and a rudder at each end, so as to obviate the necessity for turning. The distinctive feature of the craft will be the elevating deck or platform, extending the whole length of the boat, and occupying about one-third the width. This deck will be raised or lowered to suit all states of the tide, by the working of vertical screws driven by worm gearing. The steamer will be capable of carrying each trip 120 passengers and eight carts and horses.

Messrs. Russell & Co. of Port Glasgow and Greenock, have recently contracted with a Liverpool firm to build two steamers of 3,200 tons each.

As may be gathered from the Industrial Notes of this and previous issues, this enterprising firm continues to be the most

## INDUSTRIAL AND TRADE NOTES.

### THE CLYDE AND SCOTLAND.

**WAGES** disputes and strikes characterise, as a rule, the periods of briskness following upon times of dullness in the engineering and shipbuilding industries, and the present time of activity has witnessed its full share of troubles of this kind. May, however, has been signalized by a strike of a more widespread and general character than ordinary; involving as it does the bigger proportion of the ironworking section throughout

vigorously active of all the Clyde shipbuilding firms. Launching a vessel—steamer or sailing ship—is almost a weekly occurrence with them, and a berth is no sooner vacated by one vessel than keel blocks are adjusted to receive the foundation of a successor. Not content with the enormous facilities they at present possess for the output of tonnage, the firm have recently made application to the Greenock Harbour Trust for permission to reclaim and lease a considerable portion of vacant space adjoining their Greenock Yard. Messrs. Russell & Co. have had a remarkably prosperous career. Beginning with the somewhat limited yard in Bay Street, Port-Glasgow, they subsequently leased the large yard at Kingston, Port-Glasgow, which was at one time occupied by Messrs. Murray & Co., and also the yard in Main Street, Cartedyke, Greenock. Besides being tenants of these three yards, they are lessees of the Port-Glasgow Graving Dock, at which they are generally fairly well employed. They are at the present moment over head and ears in contracts, and find the accommodation afforded by their three yards much too small for carrying on the work as they would like to see it done.

The new firm organised to carry on the old-established business of Messrs. Blackwood & Gordon, Port-Glasgow, have been making the necessary preparations for a vigorous start in business, and they have just contracted with Messrs. J. & A. Allan, of the Allan Line, to build and engine two light-draught steel screw steamers, of 153 ft. length to carry 500 tons deadweight, and to be propelled by triple-expansion engines of fair power. The vessels are intended for coasting purposes at the River Plate, and have to be completed in four and five months time respectively.

The Fairfield Shipbuilding & Engineering Co. are making steady progress with the large steamship for the Pacific Steam Navigation Co., and for the Hamburg-American Packet Co. They have now under way a large Atlantic steamship of the well-known *Greyhound* order. Like the Atlantic racers, the *City of New York* and *City of Paris*, now distinguishing themselves by their great speed, the new competitor will be propelled by twin screws made of Manganese bronze, and, according to present intentions, of small diameter. The engines will be of the triple-expansion type, of a collective H.P. of 16,000 indicated. This is very much less than the newer vessels now on the Atlantic, but it is 1,500 I.H.P. more than in the case of the *Umbria* and *Etruria*. There are to be nine double-ended boilers, possibly 16 ft. long by 17 ft. 6 in. in diameter, and there will be 54 furnaces. The vessel will resemble the *Umbria* in size, but her lines will be finer. Her length and beam will be the same as the *Umbria*, 500 ft. by 54 ft., but her moulded depth will be 38 ft., which will be 2 ft. less. She will be fore-and-aft rigged on three-pole masts, and there will be three funnels. There will be nine watertight bulkheads and a longitudinal one separating the engines, while the bottom will be double, for water ballast carrying. The Hamburg people hope to have her by the beginning of next April, and their desire is that with a speed of between 20 and 21 knots she will bring them well to the front.

The Grangemouth Dockyard Co., launched from their Alloa shipyard on the 18th May, the *Empress*, the first steel vessel ever constructed at Alloa. The vessel, which is of about 1,800 tons burthen, was consigned to the water in presence of a large concourse of spectators, many of whom were present by special invitation of the builders, and who afterwards, in the company's offices, drank to the success of the shipbuilding enterprise at Alloa. On the 1st May the Dockyard Co. launched the *Winnie*, a steamer of 2,700 tons, from their Grangemouth establishment. The vessel is for C. Neilson & Son, of West Hartlepool, and the company have other two vessels building for West Hartlepool owners.

Messrs. John Scott & Co., of Abden Shipbuilding Yard, Kirkcaldy, have at present six vessels on the stocks, and they have recently contracted with the Kirkcaldy, Leith, and Glasgow Steam Packet Co., and with the Kirkcaldy and London Steam Shipping Co., to build a vessel for each of these companies. The new vessel for the first-named company is to be similar to the s.s. *John Strachan* of their present fleet, which, with the steamer just contracted for, now numbers eight vessels.

At the recent trial trip on the Clyde of the *Modjeska*, a steamer intended for Canadian lake passenger service, Mr. Tuckett, of the firm of owners, said when they first thought last year of bringing steamers to run on Lake Ontario, where there was a very large number of people now, they went to Detroit (Michigan), in order to see whether they could build vessels there. When they got to Detroit, they found

that the people in America could buy steel plate in Scotland, and take it there, pay their duty, and then have better plate than they could possibly make at the same price.

Howden's forced-draught system, which, after upwards of two year's trial in the *City of Venice*, has given the highest results in economy and efficiency, has been applied to the *City of Canterbury*, of Messrs. Geo. Smith & Son's line of Calcutta steamers. The *City of Canterbury*, which is the third steamer of Messrs. Geo. Smith & Sons fitted with this system of forced draught, was tried on the 2nd May with gratifying results. The new vessels building for Messrs. Smith are to have the same system applied.

## TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

**The Tyne.**—In the Tyne shipyards business is still exceedingly brisk, and though a good many launches have taken place during the past four weeks, there are now scarcely any berths vacant, the whole of them having been filled up as soon as their late occupants had been put into the water. It is not often that a shipbuilding firm launches two vessels with the same tide, but this feat was accomplished by Messrs. Palmer & Co. this month, they having, on the 16th, put off the s.s. *Knight Templar* from their Jarrow yard, and the s.s. *Marpessa* from their Howdon yard. The former vessel, it may be stated, was built for the same owners as the *Knight Companion*, which was launched by Messrs. Palmer in the early part of last year. This firm, as also Messrs. Armstrong, Mitchell & Co., and Messrs. Hawthorn, Leslie & Co., have been communicated with by the Admiralty as to the question of tendering for some of the war ships about to be built under the new scheme for strengthening the fleet, and very little doubt is entertained, that each of these eminent firms, will be among the successful competitors for the work. All three firms have, at the present moment, war vessels of one type or another in progress, as well as a large amount of work for the Mercantile Marine, and respecting them it is perfectly safe to say that they are not to be excelled by any firms elsewhere in respect of their competency to deal with Admiralty contracts in an effective manner. In this connection it may be stated that Messrs. Armstrong, Mitchell & Co. have one of the eight cruisers that are now on the stocks of the Elswick yard nearly ready for launching, and that the "torpedo catcher," which is being built by Messrs. Palmer for the Austrian Government, will be ready for leaving the stocks by the end of June. It may also be mentioned that the first of two powerful war sloops, ordered by the Admiralty from Messrs. Hawthorn, Leslie & Co., is in an advanced stage of building, and will probably be ready for putting into the water by the end of the year. Messrs. W. Richardson & Co., have two or three vessels of the largest class in hand just now, besides some others of smaller tonnage, but special design. Messrs. Swan & Hunter have five vessels of various sizes on their stocks, and are busily completing works of detail on the fine steamer *Aldergate*, preparatory to her final departure from the yard. Messrs. Schlesinger, Davis & Co. have launched an unusual amount of tonnage this year, the increased output being largely attributable to the extension of their establishment, which took place a few months ago. They have now some half-dozen vessels in progress, two or three of them being in very advanced stages. Messrs. Stephenson & Co. have secured some important orders lately, and are now laying the keel for a vessel of large size, three other berths being occupied with vessels in different stages of framing and plating. The Tyne Shipbuilding Co. are fitting out a handsomely modelled steamer named the *Vesta*, and will shortly have another ready for putting into the water. Messrs. Readhead are getting ready for sea a vessel named the *Eden Holme*, and have four others, in various stages, on the stocks. Messrs. Edwards have launched the last of three hopper barges which they have been busy with for some time, and have just laid the keel for a steamer of average dimensions. They have also a good-sized steamer nearly ready for launching, and another on the plating stage. The same firm are carrying out an extensive repair contract on the s.s. *Y. Y. Short* at their North Shields dock, and have also several vessels under repair in their graving docks at South Shields. Messrs. Wood & Skinner having added considerably to their working plant, are now undertaking the building of

vessels of a very large class, and it is understood that they have just secured an order for one which is to be over 300 ft. in length. This firm, it may be stated, only commenced business towards the close of 1888, and without having shared in the advantages of the period of high prices and abundant work which preceded that year, have had to encounter, in common with all other builders, the full force of the unprosperous times which followed. Having come safely through the ordeal, however, they are now reaping the reward which their enterprise deserves, and unless ordinary indications are deceptive, they have before them the probability of a successful future. Yacht owners are now largely adopting Mr. Wasteneys Smith's patent stockless anchors in their vessels, over 250 yachts having been already fitted, including the new racers *Valkyrie*, *Deerhound*, *Sethe*, &c., and several large steam yachts lately launched.

**Engineering.**—As we approach midsummer the activity of the marine engineering establishments is, if anything, more marked than in the earlier months of the year. In some cases temporary obstructions to the progress of work arise from the difficulty of getting castings and forgings delivered to date; but in spite of these impediments, contracts are being got through very rapidly, and there is every reason to expect that the aggregate output this year will very closely approximate to the extraordinarily large output reached in 1882. At Messrs. Emerson, Walker & Thompson Bros.' works, Dunston, a very large business continues to be done, all departments being quite full. Within the past few months large additions have been made, both in the engine works and forges. In the engineering department the new fitting shops have been completed, and many new and valuable appliances have been added to the plant of the machine shops. This has become imperatively necessary to meet the increasing demand for their windlass work. In passing, it may be stated that their new design patent steam windlass is giving most satisfactory results, and achieving the highest possible success. It is, indeed, according to all accounts, a windlass that must be hard to beat. In the forges there are many Government and other contracts of importance, and, with a view to further accelerate production, the firm have put down an additional steam hammer, which has been started, and is doing good work. This, together with their other numerous hammers, will be kept fully occupied for the remainder of the year. Messrs. Carrick & Wardale, of the Redhough Engine Works, continue to have an abundance of work in their establishments, the contracts in hand consisting mostly of engines and other plant for chemical works, single and double-acting pumps for use on steamships, &c. The greater part of the machinery in the establishment is kept going night and day. At the Elswick Ordnance Works, where a partial falling off of trade was experienced some months ago, a revival of activity has recently taken place, and nearly the whole of the shops are now fully manned. At this great establishment extensions are continually going on, and the last large shop added is now nearly ready for the reception of machinery. Messrs. Donkin & Nichol, of the St. Andrew's Engine Works, are now busy on steam steering gears for vessels building on the Tyne and Wear, and at other centres. The other specialities of the firm, such as engine-room telegraphs, fans for forced draught, electric bells, &c., are meeting with a steadily increasing demand, and in all departments the firm have as much work as they can deal with. Messrs. M. Mail, Jun. & Co., Tyne Dock, have just completed extensive repairs to the interior fittings of the steamship *Lebanon*, and have other contracts of a like kind now in hand. This firm are also engaged in carrying out some of the necessary processes connected with the manufacture of the new piston rings, &c., patented by Mr. W. Laing, of Sunderland, and which are now in use in a large number of steamers that have been engined at that port. At the Wallsend branch of the Darlington Forge Co.'s Works, which was started early in the year, a large amount of work for local shipbuilders and engineers has since been turned out, and several heavy contracts are now in hand. The works are situated in the very heart of a busy shipbuilding and engineering district, and having easy access to both rail and river, are well adapted to meet all the requirements essential to success. It is scarcely necessary to say that the plant is of the newest and most powerful description, and that every requisite that can in any way tend to economise time and labour, and generally facilitate production, has been provided. The other forges in the district are for the most part kept working to their full capacity, and in the foundries the pressure of work is still exceptionally great. The steel works

are kept briskly going, and the same may be said respecting the finished ironworks, and especially with reference to those establishments where their sheets constitute special product. Rope works continue to show great activity, the establishment of Messrs. Dixon & Corbitt and R. S. Newall & Co., Gateshead, being among the busiest. Besides home contracts, this firm have now in hand contracts for mining ropes, bridge ropes, tramway ropes, and shipping ropes, for customers in Russia, Newfoundland, Canada, Australia, Italy, and India. The leather and india-rubber works of Messrs. George Angus & Co. are showing quite exceptional briskness, an important Government contract, which was lately secured, having given a still greater impetus to the activity that has before existed. There is some danger of complications arising in connection with the Northumberland coal trade, the miners having decided to make a claim for a 10 per cent. advance, which the coal owners say they cannot accede to under existing circumstances. At the Wallsend Slipway and Engineering Co.'s establishment, there are now no less than fourteen sets of triple-expansion engines in hand, and the whole of the departments are consequently fully engaged. In spite of existing briskness, however, there are evident signs of a falling off in "enquiries," a circumstance which is no doubt attributable to the recent fall in freight, and the increased prices which both shipbuilders and engineers have been forced to ask, with a view to cover the recent advances in the wages rates. Besides the engines in progress, the company have some four or five sets of engines completed, which, owing to the irregular working in the shipyards, are still waiting in the shops, for vessels that are long over due, a state of matters which causes much inconvenience to everyone concerned. In the course of a few days an event of considerable interest is expected to come off, namely, the trial of the s.s. *Italia*, which was engined at these works, and is now being completed at Sir W. G. Armstrong, Mitchell & Co.'s Low Walker yard. The engines of the vessel, which, it may be stated, is intended for the service of the Hamburg Packet Co., have been fitted out with the special requirements of the latter, and are expected to develop about 2,000 H.P. The Wallsend Slipway Co. have fitted out several vessels lately with a simple system of forced draught, on the closed ashpit principle, and the results obtained have been eminently satisfactory.

**The Wear.**—Messrs. J. L. Thompson & Sons have completed the extensive alterations which, for some weeks past, they have been carrying out in the locally-owned steamship *Meath*, to fit her for the exclusive carrying of dead meat from the La Plata district. The vessel has been lengthened 36 ft., this important structural alteration having been carried out in the midship section, thereby giving the vessel 500 tons additional carrying capacity. Messrs. Thompson have also carried out the work of completely insulating the holds, so as to ensure perfect security for the cargo during transit. The engines of the vessel have been altered by Mr. William Allan (Scotia Engine Works) from the old compound type to the quadruple type, now being introduced by that gentleman. The two iron boilers which formerly did duty on the vessel have been replaced by three steel boilers, manufactured at Mr. Allan's establishment. These boilers do not occupy any greater space than the old boilers, but special pains have been taken in their construction, and a really excellent piece of workmanship is the result. This was essential, as it was necessary to attain a steam pressure of 200 lb., and with that object in view very close attention was given to even the smallest matters of detail in the construction. A trial of the vessel's engines took place on the 18th inst., and though it was not of a very exhaustive nature it was sufficient to demonstrate the fulfilment of the expectations entertained of them. The engines worked admirably, the maintenance of the steam pressure at 200 lb. giving to the vessel greatly increased speed, on a diminished consumption of fuel. The vessel will shortly proceed upon her voyage to the river Plate, and as arrangements have been made for taking a daily record of the working of the engines under possibly varying conditions, it may be expected that some interesting results will be arrived at. Among the new vessels now building at Messrs. Thompson's yard is one ordered by Australian owners for employment in the wool trade. It is stated that the firm have also secured a contract for the building of a fast-going steamer for the tea trade. Messrs. Bartram & Haswell have launched this month a large vessel named the *Hazel Branch*, built by the order of the Nautilus Steam Shipping Co., and they have now two good-sized steamers on the stocks. The Sunderland Shipbuilding Co. are quite exceptionally busy, the rivetting plant supplied

by Messrs. De Bergue & Co. aiding most effectively in the attainment of quick and economical production. Neighbouring firms are too actively employed just now to initiate any important changes in their working arrangements, but when orders become less plentiful, and the calls upon the attention of managers less numerous, it may be presumed that the Sunderland Shipbuilding Co. will find many imitators in the adoption of De Bergue's system of rivetting by air pressure. Messrs. R. Thompson & Sons are preparing to launch a cargo boat of somewhat large dimensions, and they have two others in the framing and plating stages on the stocks. The firm have executed several repair contracts this month at the Bridge Dock. Mr. James Laing launched, on the 18th inst., a large vessel, built for Hamburg owners, and a duplicate vessel for the same owners is now being laid down in the vacated berth. There are five other steamers on the stocks, and a new sailing ship, named the *Wychwood*, is being fitted out in the graving dock. Messrs. Pickersgill are also fitting out a sailing ship, recently launched from their yard, and have three steamers in various stages on the stocks. Messrs. Priestman launched, on the 20th inst., a steamer, named the *Glen Cairn*, the engines and boilers for which are being supplied by a Glasgow firm. These will be placed in the vessel at the jetty connected with the Scotia Engine Works (Messrs. William Allen & Co.), where the facilities for engineering vessels are exceptionally good. Messrs. Doxford have ordered, through Messrs. E. Beckwith & Co., a 20 H.P. Stockport gas engine, to be used for driving a portion of the machinery in their shipyard. It may here be mentioned that Messrs. J. L. Thompson & Sons have also ordered, through the same agency, a Stockport engine of large power, to be used for supplementing the steam power at their North Sands establishment. Messrs. Short Brothers launched early in the month a vessel named the *Moorish Prince*, which is to form an addition to the Prince line of steamers, managed by Mr. James Knott, of Newcastle. A vessel, named the *Exchange*, which was launched by the firm towards the close of last month, having been ordered for owners at Cardiff, has since been sold to a Belfast firm, and has been re-christened the *City of Belfast*. Messrs. Short Brothers will launch another vessel, which is being built to the order of a local partnership, about the end of the month. Messrs. Blumer, Messrs. Austin, and the Strand Shipbuilding Co. have each a satisfactory amount of new work in progress, and the two last named firms have been very busy with repair work lately.

**Engineering.**—At the Palmers' Hill Engine Works three vessels have been fitted with their boilers and machinery during the month, and a large number of Dickinson's patent crank shafts have been manufactured to order. There have also been two or three important repair contracts executed at these works during the month. The North-Eastern Engineering Co. have supplied engines and boilers to a steamer named the *Blairmont*, and have now a couple of sets of engines ready for placing in other vessels that are not yet launched. The trial trips of two vessels engine by the company have taken place during the month, the result being in each case highly satisfactory. At the Southwick Engine Works, and also at Messrs. Doxford's, full activity is still to be noticed in the different departments. Manufacturers of steam winches, steering gears, &c., continue very busy, and the same remark will correctly apply to boiler and tank works. The forges continue to be well supplied with work, the requirements of shipbuilders being just now particularly heavy. At Messrs. J. L. Thompson & Son's forge a new steam hammer, which may be classed among the most powerful appliances of the kind to be met with anywhere in the North, has just been put in operation. Rivet works continue to be actively employed, and chain and anchor works are fairly prosperous. There being a good local demand for the various products of the Monkwearmouth Ironworks, the different departments of that establishment are now kept going briskly. At the Castletown Ironworks every possible effort is being made to get the place in readiness for the commencement of the steel manufacture at an early date.

**The Hartlepoons.**—The shipbuilding industry at this centre is still in the flood-tide of prosperity, and, judging from the number of launches that have already taken place, there is little reason to doubt that the record of this year's output will be not less creditable to the port than that of former years. The aspect of affairs in connection with the marine engineering industry continues to be very cheerful, orders being plentiful at both the establishments at this centre. The following

vessels, which were engine by Messrs. Thos. Richardson & Sons, have had their trial trips during the last four weeks, the result in each case being completely satisfactory:—On April 24th, the s.s. *Urbino*, owned by Messrs. Thos. Wilson & Co., of Hull; on May 7th, the s.s. *Khio*, owned by the Pinkney Steamship Co., Limited; on May 17th, the s.s. *City of Belfast* (originally *Exchange*), owned by Messrs. Boyd & Co., of Belfast; on May 18th, the s.s. *Ethiopia*, owned by Messrs. Edward Dempster & Co., of Liverpool. The following vessels have received their machinery at Messrs. Richardson's sheer legs:—The s.s. *Elba*, for Messrs. Bowring, of London and Liverpool, with cylinders 23 in., 37 in., and 61 in., by 3 ft. 6 in. stroke, and having two large single-ended boilers, working pressure 160 lb.; the s.s. *Daventry*, for Messrs. Sivewright, Bacon & Co., of West Hartlepool, with cylinders 22 in., 35 in., and 59 in., by 8 ft. 3 in. stroke, and having two single-ended boilers, constructed for a working pressure of 160 lb. In the forging department the very greatest activity is still to be noticed.

At the Central Marine Engine Works business is as brisk as ever, all departments being fully employed. The large new forge and smiths' shop at these works is fast approaching completion, one of the steam hammers being already at work night and day. This firm have, we hear, taken a step with regard to their foundry department which we hope to hear in the future has proved beneficial to the progress of their work, and the maintenance of mutually good relations between themselves and their workmen. We refer to the fact that they have agreed to allow their iron founding department of their works to be regarded in the future as a recognised society shop, and one, therefore, in which all questions of difference will in future be settled between the men's Executive Council and the masters direct. A feature which appears to be undergoing a process of rapid development at the Central Marine Works, is the repairing trade, as during the last month there has been excessive pressure on the outside staff to keep abreast of the calls that have been made upon it. The largest job in this department has been the repairs to the s.s. *Montana*, consequent upon her having been sunk by the German steamer *Main*. The engines and boilers of this vessel have been replaced on board, and she has again proceeded on her ordinary routine of work. It is interesting to note that the steamer *Missouri*, which recently had the good fortune to pick up nearly 800 passengers in mid-Atlantic from the sinking steamer *Danmark*, was built by Messrs. W. Gray & Co., Limited, and engine at the Central Engine Works. She is not yet out of her guarantee period, having been on what was only her second voyage to America when the accident occurred. The chief engineer of the *Missouri* is Mr. A. N. Cross, who is well-known on the East Coast, and who gives a most flattering account of the excellent way in which the engines of the *Missouri* behaved while the effort was being made to tow the big emigrant ship in an Atlantic swell. The *Missouri* is a cargo steamer carrying 4,300 tons, at an average speed of 11 knots across the Atlantic, and was built especially for the London and Baltimore trade. She arrived in Tilbury dock on Saturday, May 18th, having made the return voyage in a little over 13 days. The steel works continue busily employed, and both cement and rope works are doing an active trade. Importations of timber are now becoming pretty numerous, and the docks are consequently assuming a more animated appearance.

**Stockton.**—During the week ending May 18th four vessels having an aggregate tonnage of about 12,000 tons were launched from the yards at this important centre, each of the four establishments contributing its quota to the very considerable total. The circumstance of four large vessels being launched here in one week, was, we believe, an unprecedented one, and is on that account worthy of special mention. The vessel launched by Messrs. Craig, Taylor & Co. was specially constructed for the carrying of oil in bulk, and, unless we are much mistaken, it is the first vessel of the kind that has been built at this port. In vessels of this class the details of construction are unusually complicated, and Messrs. Craig & Taylor may be complimented on the result of the severe tests through which this vessel successfully passed before her removal from the stocks. Messrs. Blair & Co.'s engine works continue to be kept exceedingly busy, and Messrs. Riley Bros.' boiler works may be similarly described.

**Middlesbro'**.—Messrs. Raylton, Dixon & Co., have their shipbuilding berths fully occupied, and they are also doing a large trade in repair work. At Messrs. Harkess & Son's yard the launching of a good-sized steamer is being prepared for, and the frame material is ordered for another which is about to be laid

down. During the past three months the firm have executed a large number of important repair contracts. The marine engine works of Messrs. Westgarth, English & Co., are very busy just now, there being in course of construction in the shops no less than 10 sets of triple-expansion engines, having an aggregate power of about 8,200 I.H.P. The boilers for these engines are also being constructed in the works which, it may be stated, were established in 1881, principally for the manufacture of marine engines and boilers. They have lately been enlarged, and at present have a capacity for delivering about 12 complete sets of marine engines per year, together with a fair proportion of general engineering and repair work. The works are most conveniently situated, so far as regards ready access to the docks and river, and have also a very complete system of railway connections. When the establishment is working full, as at present, about 300 hands are employed.

**Darlington.**—At the Darlington Forge Co.'s establishment, work is still plentiful, and amongst the contracts recently secured may be mentioned two triple three-throw steel crank shafts, 15½ in. diameter, for Clyde delivery, and an iron crank shaft 18 in. in diameter, besides four other triple shafts that are to be 12½ in. in diameter. There are now nearly completed a 12-ton cast steel stern frame, and a large three-throw ingot steel crank shaft, 14½ in. in diameter, for the Tyne—also two iron stern frames weighing about 11 tons each for the Société Cockerill, Seraing. Orders are freely booked in the steel foundry, and heavy contracts are pending. Enquiries are coming in strongly for steel castings for Admiralty work, both ship and engine departments. Amongst material recently sent from the foundry were large castings for Colonial cruisers now building on the Tyne, and also some heavy castings for ordnance requirements.

### THE MERSEY.

**UNFORTUNATELY**, one of the earliest things to chronicle this month is the fact of Liverpool owners having gone further afield than the Mersey to have their vessels built, the latest delinquents in this respect being the Ocean Steamship Co., of Liverpool, for whom Messrs. Scott & Co., of Glasgow, launched the *Calypsø* on April 12th.

At the thirteenth ordinary meeting of the Liverpool Engineering Society's present session, which took place at the Royal Institution on April 17th, the President (Mr. C. H. Darbishire) in the chair, a paper was read by Mr. Thomas Morris, F.G.S., on "Some Causes of the Crystallisation of Iron."

The carrying of the mails between this country and Canada has, owing to the strong representations made by the trading interests of Liverpool, Manchester and Birmingham to the home and Dominion postal authorities, again been entrusted to Messrs. Allan & Co., who have received instructions to carry the mails between this port and Montreal as before. By the previous (and happily short-lived) absurd arrangement of sending the mails *via* Queenstown to New York, and thence by rail to Montreal, a delay of 48 hours was incurred, an arrangement that could not be tolerated in these high-speed days.

The council of the Liverpool Engineering Society are making great preparations to adequately welcome a party of about 200 civil, mechanical, and electrical engineers, who, accompanied by about 50 ladies, purpose visiting England early in June, the *City of Richmond* having been chartered for the purpose. They will be publicly welcomed by the city authorities, and will visit the principal works of interest in the district. The Institution of Civil Engineers has also taken the matter up in right earnest, so our Transatlantic visitors will have nothing to complain of.

The seamen and firemen's strike, which we noticed in the early part of the year, is unfortunately cropping up again in anything but a pleasant manner. It will be remembered that when the last agitation terminated the men agreed to a compromise on the undertaking that the question was to be reconsidered after May 1st; and they then intimated that if the whole advance was not conceded they would go out on strike. The total number of men in the Seamen and Firemen's Union is 53,000, and the men consider that a strike at this busy time of the year would gain their ends, but it is sincerely to be hoped that wiser counsels will prevail.

Liverpool seems within measurable distance of shortly having electrical tramcars as the Liverpool Tramways Co. have entered into an agreement with the Electric Traction Co. and the North Metropolitan Tramways Co. for the supply of

one of their accumulator cars, with all the necessary electrical appliances to be used on one of the Liverpool lines for experimental purposes.

The number of emigrants leaving this port for America and Canada is not coming up to expectations, in fact the anticipated increase has not only proved a false hope but the numbers were considerably less during the last month than those for the corresponding month of former years, and were about 8,000 less than for April last year. In the shipbuilding trade returns the fact is shown that the number of sailing ships is constantly increasing, although of course the principal additions to the mercantile fleet are steamers. A contract was recently signed for a sailing ship for this port, which will be the largest sailing vessel in the world; she will be of 6,000 tons dead-weight capacity and will carry five masts. As regards size the *Liverpool*, recently built on the Clyde, will now have to take a back seat.

Taking the month all round the imports of live stock and dead meat have been fairly sustained though the numbers of quarters of beef and live cattle scarcely reach the average, sheep on the other hand have been more numerous. Timber is in fair demand, but with the fine weather now setting in large arrivals are expected, and buyers are consequently holding back a bit to see what the new timber is like. Freight and stocks are both about the same as last month, and excepting that the general tone of the market is healthy, there is little to report.

The expected passenger station between Park Street and the Dingle Tunnel, and which formed the subject of negotiations between the different persons interested, and the directors of the Cheshire Lines Committee, has been finally knocked on the head owing to the adverse decision of the railway people.

An exhibition of Carver's Fire Extinguishing Apparatus, as fixed upon the Salvage Association's steamer *Hyena*, was recently made at the Egerton Dock, Birkenhead, in the presence of a large number of engineers and others interested, the results giving great satisfaction.

The Inman and International Co.'s *City of Paris* succeeded in breaking the record by a remarkable passage to New York in 5 days, 22 hours and 7 minutes, and this in spite of tempestuous weather. Her daily runs were 445, 494, 505, 511, 504 and 398 miles. The proposed dock extension at Birkenhead will soon be put under way as the London and North Western Co.'s Bill passed the House of Commons Committee stage at the end of the month.

There seems to be some hitch in connection with the Canadian mail service, and it is even now doubtful whether Messrs. Allan Brothers offer to carry the mails with a service of 17-knot steamers for an annual subsidy of £104,000, or the offer of Messrs. Anderson & Co., of London, to carry them for the same amount but with a 20 knot service will be accepted. If the London firm carry the day the mails will then leave Southampton instead of Liverpool.

### WELSH NOTES.

**SINCE** our last issue the statutory meeting of the shareholders in the most-talked-of colliery company of our time—North's Navigation Co.—has been held in Liverpool, and at it the chairman took the opportunity of saying that a dividend at the rate of 10 per cent. would probably be paid. It is the intention of the directors to issue balance sheets half-yearly, and in pursuing this course they are well advised. It was also stated that the Llwyno Ironworks were to be sold for the benefit of the shareholders, and in this course also Colonel North's directors are well advised. However good the result shown by the collieries may be, the ironworks of this Company are situated at such a distance from the seaboard as to make their continued success very problematical.

Talking of ironworks reminds us that by the time these lines are in print the extensive ironworks at Milon Ferry will have been put up for sale by auction. The property comprises two blast furnaces, in addition to plate and bar rolls, but the whole place is antiquated, and before it can be in a position to compete with more modern works it will have to undergo very extensive alterations. The best point about the place is its site—perhaps the best in South Wales—and were a strong firm to take the works over, alter the furnaces, and put down steel-making plant, a very profitable trade could be done.

Considerable attention is being paid in this district to the attempt north-country coal-owners are making to secure a share of the Admiralty coal orders, but at the same time little fear is felt as to the result. The experience of all coal consumers points to the conclusion that Welsh coal is far and away better than the north country, and even if Government be talked into making an attempt to use Newcastle shipped coal, the result will be the same as the trial of Scotch coal. It is only fair to say that the advocates of the north-countrymen make out a *prima facie* case, but there can be no getting over the fact that everyday experience at foreign coaling stations shows that ship-owners prefer Welsh to north country coals.

The annual meeting of the Newport Harbour Commissioners was held during the past month, and statements made thereat show in a very bad light the common sense of this body. The Newport Town Council have a bill coming before Parliament, and it was decided by the Commissioners that this measure should be watched. To effect this purpose, a sub-committee was formed; and, oddly enough, every member thereof is a town councillor! It is no wonder that the Newport Harbour Commissioners are often the cause of amusement.

The Monmouthshire coal mining industry appears to be flourishing. New pits are being sunk by the Ebro Vale Co., and Powell's Tillery Co., and Messrs. Partridge, Jones & Co. are busy improving a new ash coal colliery, one they have recently purchased.

The South Wales miners have expressed their sympathy with the German miners who, at the date of writing this, are on strike. It is very considerate of these Welshmen, especially when it is remembered that the German strike has caused a rise in Welsh coal prices, and means, therefore, an improvement in the wages for Welsh miners.

Mr. Pritchard Morgan, the so-called Welsh gold king, has been in South Wales, and a representative of one of the local papers took the opportunity to interview him. We all know that the Welsh gold mining industry is not, to put it mildly, doing so well as some people expected, and this, Mr. Morgan says, is due to the excessive royalties paid to the Crown. This may be so or it may not, but it would be interesting to know whether Mr. Morgan was not fully acquainted with all the Crown's rights as to gold mining before he sold his property to the company at present owning it.

The Bill for the amalgamation of the Hull Docks and Taff Vale Railway Co.'s has passed the House of Lords Committee, but only on the understanding that clauses shall be inserted fully protecting the interests of railways using the docks. The chief objection raised by the opposition was that, with the docks and railway under the same management, the traffic along the Taff line for Barry, and the traffic along the Rhondda would be put aside as much as possible to accommodate the traffic going direct to the docks. The clauses referred to will, however, prevent any chance of this. There were several amusing points in the evidence. One was made by Mr. Inskip, the chairman of the Taff Vale Co., who gravely assured the committee that his enterprise had been one of a philanthropic nature. The company sought to do a good trade for the benefit of the Cardiff ratepayers. We all know that these ratepayers sadly need assistance, but at the same time the majority of people have all along been under the impression that the chief aim of the Taff Vale was to secure big dividends for their shareholders. The evidence of Mr. Nixon, of Nixon's Navigation, was also interesting. He related how that, some fifty years since, before Welsh coal was well known, he travelled on the Continent, and distributed the Welsh coal gratis, confident in the belief that once tried no other would be used. We here find a point of resemblance between Mrs. Langtry and Pear's soap and foreign buyers and Welsh coal.

By the way, it would be interesting to learn why the Rhondda and Swansea Bay Railway is always poking its nose into committee rooms, where it has no right to be. This company endeavoured to obtain a *locus standi* in the present instance, but of course was unsuccessful. It would be much better if the new Co. pursued the course of the Taff Vale in the past, and severely minded its own business. Work in committee is profitable to the lawyers, no doubt, but in such instances the gentlemen of wig and gown are the only people benefited.

As we have before stated the trade of Newport for 1888 showed a decided decrease. The local Chamber of Commerce recently commenced an enquiry into the cause of this, and the result of the investigation has been made known. The loss of the 200,000 tons of coal per annum is ascribed to the alterations hitherto existing between Sir George

Elliott & Powell Duffy Coal Co. Then there are certain night charges at the Alexander Dock and similar circumstances which militate against success in port. It may be possible to overcome these difficulties, but a traffic of 200,000 tons per annum is not so easily made up.

The staple trades of the district are flourishing. Tin plate makers are well booked, but, at the same time, prices are not increasing at the rate they should do in proportion to the cost of raw materials. Good prices are well sustained, although at the early part of May and the end of April prices were practically anyhow. In tinplate shipments the month is chiefly noteworthy for the shipment of the largest cargo of tin plates ever sent from South Wales. The cargo was sent away in the s.s. *Lord Londonderry*, of Belfast, and consisted of 54,518 boxes, equal to 3,528 tons. By the way, the *Missouri*, one of the Swansea regular liners, loaded at that port this month, and the opportunity was taken to show Captain Murrell that his Swansea friends had not forgotten his gallantry in rescuing the passengers and crew of the *Danmark*. Captain Murrell is looked upon as a Cardiff boy, but he is more a north-countryman, his father being a Hartlepool man.

Ship-repairing in the district is going on in a satisfactory manner, all the docks being well engaged. There is a big job in Cardiff for some one to secure, the s.s. *Westergate* being there very badly damaged. She is to be sold by auction as she lies, and her repairs will amount to upwards of £6,000.

## BELFAST TRADE NOTES.

SO far as trade activity is concerned, the Belfast district has nothing to complain of, several large vessels are now on the stocks, and, indeed, the tonnage for this year promises to be larger than it has ever been before. Work which was interrupted by the Easter holidays was, immediately after their termination, resumed in right earnest, and is now being carried on without any hitch between masters and men.

Mr. Charles J. Biggar, proprietor of the Foyle Shipyard, Londonderry, has lately been the recipient of very valuable presentations from his *employés* and the merchants with whom he has dealings.

Messrs. Harland & Wolff were very busy in the early part of the month getting the new White Star liner *Teutonic* ready for the visit of Prince Albert Victor.

The favourite river paddle steamer *Clandeboyne*, built about three years ago by Messrs. Workman, Clark, & Co., for the Belfast, Bangor and Lorne Steamboat Co., has been bought by a Copenhagen firm, and will be used by them for carrying passengers to the Paris Exhibition. Rumour has it that £20,000 was the price paid for this fine vessel. We are glad to say that in this district not only shipbuilders, but also engineers and boiler makers have their hands full; in fact, the only complaint is scarcity of workmen. In the shipyards, especially, skilled labour is at a premium, and many more hands could find employment. Machine makers are very busy on past orders, the bulk of them being from abroad. Business is in a very healthy state all over the North of Ireland, and every branch of industry is fully employed.

## LEITH NOTES.

NO new orders of any consequence have been received here this month, but those already on hand are keeping all the yards busy. No launches have occurred since last month, but June promises to have a large number. The Danish steamer *Kopernicus*, recently launched by Messrs. S. and H. Morton for Messrs. Marcus Kohn & Sohn, had a trial trip in the beginning of the month, when the speed obtained was considered highly satisfactory. On the 20th inst. the small wooden screw tug *Colonist*, engined by Messrs. Hawthorns & Co. for Messrs. Messina Bros., Port Elizabeth, went her trial trip, when the engines indicated nearly 100 H.P. working at 130 revolutions; those on board expressed satisfaction at the speed obtained.

The s.s. *Britannia* (632 tons net), recently purchased by Messrs. George Gibson & Co. for their Continental trade, arrived here from Dundee on the 11th inst.

The wages question still continues unsettled, but no definite action has been taken by masters or men. The rivet boys went out on strike here on the 17th and have not yet gone in.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES.—ENGLISH.

**Renwick.**—On April 18th there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, Willington Quay-on-Tyne, a steel-screw steamer, built to the order of Messrs. Fisher, Renwick & Co., of Newcastle. She is of the following dimensions:—Length, 210 ft.; breadth, 31 ft.; and depth, moulded, 16 ft.; and will be fitted with powerful triple-expansion engines by Messrs. The North-Eastern Marine Engineering Co., Limited, of Wallsend. All modern improvements for the rapid loading and discharging of cargo are supplied. On leaving the ways the vessel was gracefully named the *Renwick* by Mrs. J. A. Finzi, of London.

**Talavera.**—On April 27th Messrs. William Dobson & Co. launched from their shipbuilding yard, at Walker, a steel screw steamer, built to the order of Messrs. Henry Scholefield & Son, of Newcastle-upon-Tyne. Her dimensions are:—275 ft. by 37 by 18.6 ft., and she is constructed on the well-deck principle, and will be engined by the North-Eastern Marine Engineering Co., Limited, Wallsend. On leaving the ways the vessel was named the *Talavera* by Miss Cole.

**St. Thorwald.**—On April 30th there was successfully launched from the shipbuilding yard of Messrs. S. P. Austin & Son, Sunderland, a handsomely-modelled screw steamer of about 2,130 tons gross register, constructed of Siemens-Martin mild steel, under special survey, to class 100 A 1 at Lloyd's. She is designed to carry a deadweight cargo of about 3,100 tons on a light draught. She will be fitted with triple-expansion machinery of 1,000 I.H.P., by Messrs. Blair & Co., Limited, Stockton-on-Tees. As she left the launching ways she was named *St. Thorwald* by Miss Flora Macdonald, of Manchester.

**Holme Eden.**—On April 30th, at the yard of Messrs. John Readhead & Sons, South Shields, a steel-screw steamer was launched, named *Holme Eden*, which has been built to the order of Mr. William Wright, of South Shields and London. The dimensions of the vessel are:—Length, 290 ft.; breadth, 39 ft.; depth of hold, 20 ft. She is of the improved well-decked type, and classed 100 A 1 at Lloyd's, under special survey. Her gross carrying capacity is 3,450 tons. The most modern appliances for the reception and discharge of cargoes have been introduced, and the hold fittings are specially adapted to the requirements of the Grain Cargoes Act. The engines are on the triple-expansion principle, and steam will be supplied from two large steel boilers, working at a pressure of 160 lb. to the square in. The engines have been built under the superintendence of Mr. W. Menzies, and Captain G. W. Freeman has inspected the construction of the hull. The vessel was named by Miss Jenny Waller Wright, daughter of Mr. Henry Wright, of Tynemouth. The *Holme Eden* is the fourth steamer built for the same firm by Messrs. Readhead & Son.

**Mamari.**—On May 1st Messrs. W. Doxford & Sons successfully launched from their yard, at Pallion, the above-named beautifully-modelled steamer, built for the Shaw, Saville & Albion Co., Limited, of 34, Leadenhall Street, London. She is built of steel, with cellular bottom fore and aft, is to Lloyd's 100 A 1 class, and her dimensions are:—Length between poops, 360 ft.; breadth, extreme, 42 ft.; depth, moulded, 31½ ft. The engines are the ordinary triple-expansion three-crank, by Messrs. Doxfords, the cylinders being 27 in., 44 in., and 71 in., by 48 in. stroke, and they are supplied with high pressure steam from two exceptionally-large boilers, which will give the vessel a mean speed of 11 knots loaded. She is fitted for the New Zealand meat trade, with large refrigerating machinery, by the Haslam Foundry Co., of Derby, and will have insulated chambers fitted for 40,000 carcasses. She is fitted with Maguinnis' patent steam steering gear, Harfield's windlass, Hastie's screw gear aft, and has steam winches, with Helicon gearing, by Messrs. Welford Bros., of Pallion. The captain's cabin is beautifully got up in walnut, while the officers' and engineers' cabins are tastefully got up in the poop of polished hardwood, the crew and fireman being comfortably berthed in the fore-castle. During construction, the vessel has been superintended by Capt. J. Mackirdy, of London, and the machinery by Mr. Carrick, and as she left the ways was gracefully christened the *Mamari* by Mrs. W. L. Byers, of Sunderland.

**Valkyrie.**—On May 1st the cutter yacht *Valkyrie*, which has been built by Messrs. Fay & Co., of Southampton, from designs

by Mr. Watson, and which was intended to race for the America Cup, was successfully launched in the presence of a considerable body of spectators. The ways were knocked away at a quarter to twelve, and the vessel glided smoothly and steadily towards the river channel, but when about half distance she came to a standstill. The delay, however, was not long, as a tug was at hand, and the *Valkyrie* very soon entered the water, and was at once towed off to the inner dock. The *Valkyrie* is composite built, all her frames being of steel, her topsides and deck fittings being of teak, with hardwood bottom plankings. The registered dimensions are:—Length, 85 ft.; beam, 15.9 ft.; depth, 11.6 ft.; tonnage, 56.76. The length on the load water line is just under 70 ft.

**Moorish Prince.**—On May 8th Messrs. Short Brothers launched from their shipbuilding-yard, Pallion, Sunderland, a handsomely-modelled steel screw steamer, to the order of the Prince Steam Shipping Co., Newcastle, of the following dimensions:—Length, 300 ft.; breadth, 39 ft.; and depth, moulded, 21 ft. 2 in. The vessel is constructed under special survey to the highest class for steel in Lloyd's Registry, and is built on the cellular double-bottom principle for water ballast, all fore-and-aft, and web-frames dispensing with hold beams. There is a short full poop aft for accommodation of captain and officers, handsomely fitted up with Lincrusta-Walton panels; long raised quarter-deck between poop and bridge, the latter extending before foremast, with accommodation for engineers at after end and crew in fore end; open shelter fore-castle, which is connected to bridge with a gangway. There are four large hatchways with a powerful steam winch at each, and donkey boiler fitted on deck; steam steering gear amidships, patent direct steam windlass, and all the latest improvements. On leaving the ways the vessel was named *Moorish Prince*, the ceremony being performed by Miss Elliott, of Howdon-on-Tyne. The engines, which are to be fitted by Mr. John Dickinson, of Sunderland, are of 200 H.P., on the triple-expansion principle, having two steel boilers of 150 lb. working pressure, with all the latest improvements in marine engineering.

**Antelope.**—On May 4th Messrs. Laird Brothers launched from their works at Birkenhead the fine screw steamer *Antelope*, the second of three building for the Great Western Railway Co. in connection with their new service between Weymouth and the Channel Islands. The new steamer was christened by Miss MacIver, daughter of Mr. David MacIver of Woodslee, one of the directors of the company, who was also present together with Captain Squire, T. S. Lecky, the company's marine superintendent, and a party of ladies and gentlemen including Colonel Spurr, Captain Cabassa, and other officers of the Argentine war vessel *Almirante Brown*. The *Antelope* is a smart-looking handsomely-modelled twin-screw steamer of about 900 tons, and will be fitted in the most modern and complete style as a first-class passenger steamer with saloon amidships lighted by electricity, and replete with every appliance conducive to the comfort and safety of passengers. Her machinery, which will consist of two separate sets of triple-expansion engines of great relative power, and the vessel is expected to attain a high speed.

**Collingham.**—On May 13th Messrs. Raylton, Dixon & Co., Middlesbro', launched from their Cleveland Dockyard a fine steel-screw steamer, built to the order of Messrs. Harris & Dixon, which was named the s.s. *Collingham*. This vessel, whose leading dimensions are—Length, 295 ft.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in.; with a deadweight capacity of 3,680 tons, is of the raised quarter-deck type, but with long bridge extending to fore-castle, becomes a "partial awning deck." Her engines will be fitted by the North-Eastern Marine Engineering Co., Wallsend, of 210 N.H.P., with cylinders 23 in., 37 in., and 61 in., by 42 in. stroke.

**Cazengo.**—On May 13th Messrs. Earle's Shipbuilding and Engineering Co., Limited, launched from their yard, at Hull, the second of two steamships they have on order for the Empreza Nacional's mail and passenger service between this country, Lisbon, and the West Coast of Africa. The ship is built of steel, the dimensions being 340 ft. by 41 ft. depth of hold to top of floors, and she is classed at 7 a spar deck vessel on the cellular system of construction, water ballast arranged for in double bottom and in tank aft. There are three complete decks and a fore-castle, and large houses are fitted aft and amid cabin entrances, officers' quarters, &c. Accommoda-

vided aft, under the spar deck, for 72 first-class passengers, the dining saloon and the entrance to their cabin being in after house, and this part will be lined entirely with various coloured polished marbles, tastefully decorated; while the cabins and all conveniences will be handsomely furnished in polished hardwoods. Large sliding windows are fitted, to give ample light and ventilation, which is very necessary for the tropical service, for which the vessel is intended. Provision is also made amidships for 32 second-class passengers, in substantial style, with dining saloon and all necessary fittings; and further forward, in the 'tween decks, is accommodation for 120 third-class passengers, the bed places for these being on F. H. Street's patent plan for emigrant berths. The crew are berthed in the topgallant-forecastle, where is situated, the lamp room, stores, &c., in convenient positions. The ship will be schooner-rigged, and have powerful steam winches, of Earle's special design, for working cargo, and a Bow McLachlan steam steering gear amidships and screw gear aft. The builders have carried out an elaborate installation for lighting throughout by electricity, in addition to which, the usual arrangement for illumination by the ordinary system of lamps will be made. The machinery consists of a set of triple-compound three-crank engines, also of Earle's manufacture, with cylinders 32 in., 48 in. and 80 in. diameter by 48 in. stroke of piston, steam for which will be supplied from two large double-ended boilers of steel, made in accordance with Lloyd's and the Board of Trade rules, for a working pressure of 160 lb. per square in., and having each six Fox's corrugated furnaces, fitted with Henderson's patent fire bars. The vessel has been designed and built under the personal superintendence of the owners' representative in this country, Mr. T. C. Laws.

**Philip Maxsted.**—On May 13th there was launched by Messrs. Cook, Welton & Gemmell, at Hull, a steam trawler for the Humber Steam Fishing Co. Miss Florence Maxsted, daughter of Mr. E. P. Maxsted, J.P., of Hull and Hessele, named her the *Philip Maxsted*. The *Philip Maxsted* is the seventh steamer which has been built for the company. Her dimensions are 100 by 20.9 by 11 ft., and she is classed 100 A 1 at Lloyd's. She is fitted with compound engines, built by the Humber Ironworks Co., of 45 H.P. nominal.

**Blairmount.**—On May 13th there was launched from the building yard of the Sunderland Shipbuilding Co., a fine steel screw steamer for the Grampian Steamship Co., Aberdeen, of a capacity of 2,100 tons deadweight, and with triple-expansion engines (by the North-Eastern Marine Engineering Co.) of 150 H.P. This vessel has a short poop, raised quarter-deck, and long bridge, extending to the topgallant forecastle, and should prove a valuable addition to the company's fleet, which is managed by Messrs. Adam Bros., at Aberdeen, Newcastle and London. She is expected to be ready for sea by the end of the month. The vessel, on leaving the ways, was named the *Blairmount* by Miss Gracie Ritson, youngest daughter of Mr. Utrick Ritson, coalowner.

**Dunsley.**—On May 13th there was launched from the shipbuilding yard of Messrs. Joseph L. Thompson & Sons, North Sands, Sunderland, a handsomely modelled steelscrew steamer of the following dimensions, viz.:—Length over all, 295 ft.; length between perpendiculars, 284 ft.; breadth (extreme), 38 ft.; depth, moulded, 21 ft.; deadweight capacity about 3,050 tons at 19 ft. 3 in. mean draught, with Lloyd's freeboard; classed 100 A 1 at Lloyd's. This vessel has been built to the order of Messrs. J. H. Barry & Co., of Whitby, and is the ninth vessel built by this firm for the same owners. She is built on the web frame and longitudinal plate intercostal system, thereby dispensing with hold or orlop deck beams, has raised quarter-deck, full poop, long bridge extending before the foremast, 120 feet in length; topgallant forecastle, iron decks (except the poop), six steel bulkheads, water ballast fore and aft, including peaks; five cargo hatchways, and is fitted with the latest improvements, viz.:—Messrs. Clarke & Chapman's patent steam windlass; four large steam winches by Lynn, of Sunderland; Pepper's steam and hand steering gear combined; also Hastie's patent screw steering apparatus on the poop. The engines, which are being built by Mr. John Dickinson, Palmer's Hill Engine Works, Sunderland, are of the triple-expansion type, of 180 N.H.P., cylinders 21½, 35 and 58, stroke 39 in. She has two steel boilers of 160 lb. working pressure, and will also be fitted with Dickinson's patent steel-built crank shaft, and Kirkaldy's compactum patent feed water heater, and Blake's patent donkey boiler of large size, and other appliances for the rapid loading and discharging of cargoes. The vessel is intended for the general carrying

trade, and has been fitted up in every respect to meet the requirements of the Grain Cargoes Act of 1880. As the vessel left the ways she was named *Dunsley*, by Miss Browning, of Bristol, granddaughter of Mr. George Corner, of that city, one of the owners of the vessel. When completed she will be commanded by Captain W. Jefferson, late of the steamship *Crescent*, of Whitby.

**Doric.**—On Tuesday, May 14th, Messrs. Earle's Shipbuilding and Engineering Co. launched the new steam fishing vessel *Doric*, which they have built for the Grimsby Steam Fishing Co., Limited. This boat is intended for line as well as trawl fishing, her dimensions being 100 ft. by 20 ft. by 11 ft. 6 in. She is built to Lloyd's highest class, with considerable excess of scantlings in various respects, and has provision in the holds, in addition to the fish well, for the storage of fish, ice, &c. She is fitted with two sets of trawl gear, including fairleads, ports, rollers, revolving bollards, steam winch, &c. Her machinery consists of a set of triple-compound, three-crank engines, and a powerful steel boiler, made for a working pressure of 150 lb. per square inch, which has also been made by Earle's Co.

**Douro.**—On Thursday, May 16th, Messrs. Richardson, Duck & Co. launched from their building yard at South Stockton a steel screw steamer of the following dimensions:—Length over all, 307 ft. 4 in.; Breadth, extreme, 40 ft.; Depth in hold to tank top, 19 ft. The vessel has been built for Messrs. Thomas Wilson, Sons & Co., of Hull, under the personal superintendence of Mr. J. F. Wilkins, the owners' surveyor. She has a long raised quarter-deck with a long bridge joined to the forecastle, and a double bottom on the cellular principle extending fore and aft for water ballast. Her engines, by Messrs. T. Richardson & Sons, of Hartlepool, are triple-expansion and have cylinders 22½ in., 37 in. and 61 in., with 39 in. stroke. As she was leaving the ways the vessel was christened *Douro* by Miss Stothart, daughter of James Stothart, Esq., Stockton-on-Tees.

**Attila.**—On May 16th there was launched from Messrs. B. Craggs & Sons', Middlesbrough, shipyard, the steel steamer *Attila*, of the following dimensions:—Length over all, 290 ft.; breadth, 37 ft. 6 in.; depth, 26 ft. 9 in.; and is fitted for carrying petroleum in bulk, having 14 compartments, with a capacity for 2,750 tons of oil. This vessel has been built to the order of Messrs. J. M. Lennard & Sons, of Middlesbrough. Her engines, built by Messrs. Westgarth, English & Co., marine engineers, etc., of Middlesbrough, are of the triple-expansion type, 180 N.H.P., having cylinders 21 in., 34 in., and 57 in. by 39 in. stroke.

**Tancarrville.**—On May 16th Messrs. Craig, Taylor & Co., launched from their Thornaby shipbuilding yard, Stockton-on-Tees, the largest vessel that they have as yet built. Her dimensions are as follows:—Length over all, 301 ft.; breadth, 37 ft.; depth, moulded to spar deck, 26 ft. 8 in. The vessel will carry about 3,200 tons, all told, is specially constructed for conveying oil in bulk in 13 compartments, and is the highest class in Lloyd's spar deck rule. She is rigged as a three-masted schooner, and fitted with Pepper's steam steering gear, outfit of winches by Robert Rogers & Co., and patent steam windlass by Emerson, Walker and Thompson Bros., Limited. She has also steam cooking apparatus by Grieve & Gillespie. The engines have been constructed by Black, Hawthorn & Co., on the triple-expansion surface condensing principle, with cylinders 22 in., 36 in. and 58 in. diameter, by 42 in. stroke; two boilers, 14 ft. 9 in. by 10 ft. 6 in. long, with six Brown's ribbed furnaces, working pressure 160 lb. per square inch. She has also Kirkaldy's feed heater steam turning and reversing gear, with steam brake. Indicated power in ordinary working, 1,100 horse. The vessel is also fitted with very superior pumping arrangements, and a magnificent installation of electric light by Messrs. Hayward, Tyler & Co., hydraulic and electrical engineers, of London. The wiring is carried out on the "double wire" principle, and the wires are thoroughly cased and protected. The vessel, before being launched, has been tested under the superintendence of the owners and Lloyd's surveyors, to a very heavy pressure—15 ft. above the main deck—and has been found to be highly satisfactory. Immediately after launching, the vessel was towed to the builders' wharf, where she will receive her masts, winches, steering gear, and other fittings, and will proceed to the engineers in Newcastle early next week. The vessel has been built to the order of Alfred Stuart, Esq., London, and as she left the ways she was very gracefully christened the *Tancarrville* by Miss Muir, of Westmoreland Terrace, Newcastle. The vessel has been built under

the superintendence of the owner's representatives, Messrs. Matthews and Bissett, and also Messrs. Flannery, Bagallay & Johnson, of London. A number of friends of the builders were present at the launch, amongst whom were:—Thomas Taylor, Esq., J.P., A.C.C., and Mrs. Taylor, of Batley, A. W. Taylor, Esq., of Batley, Mrs. Craig, Miss Rudd, Miss M. Rudd, Miss Cunningham, Mrs. Watson, Miss M. Watson, Capt. Dunbar, Mrs. Candlish, Edinbro', Mrs. Johnson, London, Mr. Bissett, Dr. and Mrs. Wilson, Rev. J. and Mrs. Bogue.

**Darenty.**—On Thursday, May 16th, Messrs. Edward Withy & Co. launched from their yard at Hartlepool a large steel screw steamer, built to the order of Messrs. Sivewright, Bacon & Co., of West Hartlepool. She is a large vessel, measuring over 300 ft. in length, constructed throughout of Siemens-Martin steel, and built to the highest class at Lloyd's. She has a long raised quarter-deck, long bridge house, and top-gallant-forecastle. The holds are fitted with iron grain divisions, and iron cargo battens; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after holds the vessel is built on the web-frame system, which gives a very strong type of ship and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and aft for water ballast, and the after peak is also available for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, Meredith's patent donkey boiler, steam steering gear amidships, screw gear aft, direct steam windlass on forecastle, patent stockless anchors hauling up into hawse pipes, and all other modern appliances are fitted for the handy working of the vessel. The saloon and cabin, providing accommodation for the passengers, captain, and officers, is handsomely finished in polished hardwood, with neatly painted panels, executed in a very effective style by the decorative staff of ladies employed by the firm. The vessel will be rigged as a two-masted fore-and-aft schooner, with steel pole-masts, and all cargo appliances for expeditious handling of cargo. The engines have been constructed by Messrs. T. Richardson & Sons, Hartlepool, and are of the triple-expansion type, with two large single-ended boilers. The hull and machinery have been constructed under the personal supervision of Captain Bacon. On leaving the ways the vessel was gracefully christened *Darenty* by Miss Sivewright, of West Hartlepool.

**Barracouta.**—On May 16th a valuable addition was made to the Royal Navy by the launch at Sheerness Dockyard of the new third-class protected cruiser *Barracouta*, which took place in the presence of Vice-Admiral T. B. Lethbridge, Commander-in-Chief at the Nore, and a large attendance of spectators. The christening ceremony was performed by Mrs. Fane, wife of Captain C. G. Fane, A.D.C., superintendent of the dockyard. The vessel has a displacement of 1,580 tons, and engines of 3,000 H.P., which are to propel her at 16½ knots per hour. Her armament consists of six 4.7 in., and four 3-pounder quick-firing guns, as well as two torpedo tubes. The vessel has cost about £97,000.

**Sarah Radcliffe.**—On May 16th Messrs. Ropner & Son launched a steel screw steamer of the following dimensions:—Length over all, 282 ft. 6 in.; breadth, 38 ft. 10 in.; depth, moulded, 21 ft. 11 in. This steamer has been built under special survey to class 100 A 1 at Lloyd's, and will carry 8,250 tons cargo and fuel, on Lloyd's summer freeboard; she has a short, full poop, in which is fitted accommodation for captain and officers, raised quarter-deck, long bridge extending to foremast, short well and t.g.f., cellular bottom for w.b. She is built on the web frame principle, and will have all the latest improvements for a first-class cargo steamer. Her engines are by Messrs. Blair & Co., Limited, on their improved triple-expansion principle, of 160 H.P. nominal, with two extra large steel boilers, working 160 lb. The steamer has been built to the order of Messrs. Evan Thomas Radcliffe & Co., Cardiff, and as she left the ways was christened *Sarah Radcliffe* by Miss Ropner, of Preston Hall, Stockton-on-Tees.

**Begonia.**—On May 16th Messrs. Cochrane, Cooper, & Schofield launched from their shipyard, at Grovehill, Beverley, an iron steam trawler, built to the order of the North-Eastern Steam Fishing Co., Grimsby. The vessel, which was named the *Begonia* by Miss Morris, daughter of a member of the firm, was of the following dimensions:—Length between perpendiculars, 105 ft.; breadth, 20 ft. 6 in.; depth of hold, 11 ft. 6 in. She is adapted for both trawling and line fishing, being fitted with a

well 19 ft. deep, the width of the vessel, for conveying live fish, and a well-deck above for carrying dead fish. She will be supplied with engines of 50 H.P., triple-expansion, by Messrs. Holmes & Co., of Hull. This is the second vessel of the kind built for the same company, and the firm have three more on hand.

**Hazel Branch.**—On May 16th there was launched from the shipbuilding yard of Messrs. Bertram, Haswell & Co., South Dock, Sunderland, a large and beautifully-modelled steel screw steamer for the Nautilus Steam Shipping Co., of which Messrs. F. and W. Ritson are the managers. The following are the dimensions and particulars:—Length, 300 ft.; breadth, 40 ft.; depth, 28 ft.; deadweight capacity about 14,000 tons. She has been built under special survey to take the highest class in Lloyd's registry, and both spar and main decks are of steel. The cabins are aft, with an entrance from a house on deck. The officers are placed under the bridge, and the crew are berthed in a large topgallant forecastle. There are five hatchways with a powerful winch at each, supplied from an extra large patent donkey boiler, by Clark, Chapman, Parsons & Co. Davis's patent steam steering gear is placed amidships, and W. B. Thompson's double-acting screw gear aft. Iron shifting boards are fitted in the lower holds. There is a double bottom on the cellular principle right fore-and-aft, divided into five tanks for trimming purposes, and everything that previous experience has suggested has been adopted for the safe and economical working of the vessel. The engines, of 1,800 I.H.P., will be supplied by Mr. John Dickinson, and will be fitted with the latest and best improvements in marine engineering, including Kirkaldy's patent steam heater, Martin's patent furnace doors and fire bars, &c. As the vessel left the stocks she was named the *Hazel Branch* by Miss Mabel Ritson.

**Knight Templar.**—On May 16th there was launched from Messrs. Palmer & Co.'s Jarrow yard a large steel screw steamer of the following dimensions:—Length between perpendiculars, 400 ft.; breadth, moulded, 47 ft.; and depth, moulded, 30½ ft. The vessel is built to class 100 A 1 at Lloyd's, of the three-decked type, the scantlings being considerably in excess of Lloyd's requirements. She is divided into seven watertight divisions by steel bulkheads, and water ballast is fitted in a cellular double bottom, all fore-and-aft. A complete set of wood shifting boards and trimming hatches is provided for the carriage of grain cargoes. Emerson & Walker's direct steam double capstan windlass is fitted forward, Harrison's steam steering gear amidships, and Hastie's screw gear aft. The vessel is designed to load over 6,780 tons deadweight. On leaving the ways the vessel was named the *Knight Templar* by Mrs. Denton, wife of the assistant general manager of the Palmer Co. The vessel has been built under the personal superintendence of Captain Muir, for Messrs. Greenshields, Cowie & Co., of Liverpool.

**Rolpino.**—On May 16th a large steel screw steamer was launched from the shipbuilding yard of Messrs. Robert Stephenson & Co., Limited, Hebburn. She has been built to the order of Messrs. Thomas Wilson, Sons & Co., of Hull, and is the second vessel recently built by Messrs. Stephenson for the Wilson Line. The dimensions of the steamer are:—Length, 304 ft.; beam, 39 ft.; depth, 21 ft. 8 in., and she will carry about 3,500 tons deadweight on a moderate draught of water. The vessel will take the highest class at Lloyd's, and has been constructed on the raised quarter-deck principle, but there is no "well" forward, the whole of the main deck being covered by an awning deck. There is a cellular double bottom for water ballast throughout the vessel's length, and the collision bulkhead is of conical form. All the deck fittings are of the most improved description. There are two steering gears fitted in a wheel-house aft, and connected to one of Spencer's cast steel quadrants, the steam gear being worked from the bridge amidships by means of rods led under the deck. Linklater's patent freeing ports are fitted on the bulwarks; Emerson, Walker & Co's patent direct-acting windlass; the anchors are Tyzack's stockless type, arranged to house into the hawse pipes. Steam heating is supplied to the cabins, and steam pipes are lead to each compartment for extinguishing fire. The propelling machinery, which has been constructed at Messrs. R. Stephenson & Co's, Limited, South Street Works, Newcastle, consists of a set of triple-expansion engines, having cylinders respectively 22, 35, and 59 in. diameter, and a piston stroke of 39 in., the boiler pressure being 160 lb. Mr. John Spear, superintendent engineer of the Wilson Line, has supervised the construction

of the engines, and the building of the ship has been overlooked by Mr. J. T. Wilkins, superintendent shipbuilder to Messrs. Wilson. As she left the ways the vessel was named the *Rolpino* by Mrs. George Stephenson, wife of one of the managing directors.

**Daisy.**—On May 18th there was launched from the Vectis Shipbuilding Works of Messrs. William White & Sons, at Cowes, a steel twin-screw steam yacht, built to the order of Alexander Hume, Esq., of Castle Florida, Buenos Ayres. The vessel, which is built entirely of steel, is 105 ft. long, 13 ft. 6 in. beam, and depth, 6 ft. 11 in.; her draught of water being only 4 ft. 6 in. She is fitted up in the most luxurious and expensive manner, all the cabins and saloon being in electroplate and teak and maple. The yacht is to be fitted with two pairs of compound surface-condensing engines of 140 I.H.P. Cylinders 9 in. and 18 in., with a 12-in. stroke. The boiler, which is of steel, as well as the vessel, and all the machinery have been constructed by Messrs. William White & Sons, and are all constructed to Lloyd's highest class. The vessel, on leaving the ways, was named *Daisy*, and measures 75 tons.

**Bentala.**—Messrs. Schlesinger, Davis & Co., launched from their shipbuilding yard, Wallsend-on-Tyne, a large steel screw steamer named the *Bentala*, built to the order of Mr. Joseph Hault, of Liverpool, the managing owner of the Ben Line of steamers of that port. The vessel is of the following dimensions:—Length between perpendiculars, 302 ft.; breadth, moulded, 40 ft.; depth, moulded, 23 ft. 2½ in., and is designed to carry a deadweight cargo of 4,000 tons. She is constructed on the cellular bottom principle throughout for water ballast and has a poop long-raised quarter-deck, long bridge extending beyond foremast, and a topgallant forecastle. Shifting boards and trimming hatches will be fitted in each hold, in order to comply with the Grain Cargoes Act. She will be rigged as a two-masted fore-and-aft schooner. Maginnis's patent steering gear will be fitted in the engine-room, with shafting running along the deck, acting direct on the quadrant, thus dispensing with all chains, rods, sheaves, &c. Messrs. Clark, Chapman, Parsons & Co.'s patent steam windlass will be fitted on the forecastle. The vessel will also be fitted with four powerful steam winches for the rapid loading and discharging of cargo, special arrangements being made on deck for the stowing of all cargo gear. The accommodation for the captain, officers, and engineers is amidships in houses on the top of the bridge deck. The forecastle being fitted up in a substantial manner for the crew. The *Bentala* classes 100 A 1 in steel at Lloyd's, and has been built under special survey. The engines, of the triple-expansion description are of 180 N.H.P., having cylinders 22 in., 34 in., and 56 by 42 in. length of stroke. The boilers are of steel, two in number, working at a pressure of 160 lb. per square in. The machinery has been constructed by Messrs. Black, Hawthorn & Co., Gateshead, and, together with the hull, has been erected under the personal superintendence of Mr. A. C. Hay, of Liverpool, the owner's superintendent engineer. She was named the *Bentala* by Mrs. Davis, wife of the builder. This is the second vessel built by Messrs. Schlesinger, Davis & Co., for the same owner, and is a sister ship to the *Benicwick*, launched a few weeks ago, and now on her first voyage from Cardiff, to which port she made a very satisfactory trial trip from the Tyne.

**Saint Anns.**—On May 18th there was launched from Messrs. Craggs & Sons' Stockton shipyard, an iron screw steamer named the *Saint Anns*, of the following dimensions:—Length over all, 183 ft.; breadth, 28 ft.; depth, 14 ft. 3 in., with a deadweight capacity of 900 tons. This vessel has been built for Messrs. John Pile & Co., of London. Her engines, built by Messrs. Westgarth, English & Co., marine engineers, &c., of Middlesbrough, are of the triple-expansion type, 65 N.H.P., having cylinders 13 in., 21 in., and 35 in. by 24 in. stroke.

**Duchess of Cornwall and Theodorich.**—Not the least interesting event connected with the visit to West Hartlepool of H.R.H. Prince Albert Victor, on the 1st of May, was the launching of two fine steamships from the shipbuilding yard of Messrs. W. Gray & Co., Limited. After the opening of the new Municipal Buildings, the Banquet in the armoury, and a cruise round the bay in Christopher Furness' steam yacht *Meteor*, His Royal Highness, accompanied by a large number of ladies and gentlemen, including the Mayor and Corporation, the members of the Council for the Borough and South East division of the County of Durham. All being ready the Prince took up his position at

the bow of the first of the two new steamers, and in the orthodox fashion, by breaking a bottle of wine against her bow, christened her *Duchess of Cornwall*. His Royal Highness then, by means of a lever, released the vessel, and amidst the ringing cheers of a vast crowd of spectators, she glided beautifully into the water. She is for the same owners and is sister ship to the *Duke of Cornwall*, launched from the same yard last year for Mr. Richard B. Chellev, of Truro, and it is a noteworthy coincidence that the name determined upon when the contract for the ship was signed is one of the titles of the Prince's Royal mother, the Prince and Princess of Wales being Duke and Duchess of Cornwall. His Royal Highness afterwards proceeded to another part of the works and witnessed the launch of the steamer *Theodorich*, which is the first of four building in the yards of Messrs. W. Gray & Co., Limited, for Herr Johannes Lange, of Kiel, Germany. She is an awning-decked vessel, 245 ft. between perpendiculars, 35 ft. beam, and 21 ft. 11 in. depth of hold, while the *Duchess of Cornwall* is of the familiar well-decked type, with the improved bridge introduced by the builders, extending to the fore hatch. Dimensions:—260 ft. by 36 ft. 6 in. by 18 ft. 2½ in. hold. Both ships are built of Siemens-Martin steel, to class 100 A 1 at Lloyd's, and will be fitted with the best modern appliances for the rapid loading and discharging of cargo, and for their safe navigation. Triple-expansion engines and two steel boilers are being supplied to each ship by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. The *Duchess of Cornwall* is the third steamer launched by the builders for Mr. Richard B. Chellev, and they have a fourth in hand for him, to be called *Cornubia*. Mr. J. Williams, on behalf of the owners, has superintended the construction of both ship and machinery. Messrs. Menzie & Blagburn have supervised the building of the *Theodorich*, which ship was gracefully christened by Lady Alice Havelock Allan.

**Goldfinch.**—On May 18th the new gun-vessel *Goldfinch* was launched at Sheerness. She was designed by Mr. W. H. White, Director of Naval Construction, and is an improvement upon the *Pigmy*, which was launched at Sheerness a year ago, being a foot wider, 3½ in. deeper, and possessing an additional displacement of 50 tons. Her principal dimensions are as follows:—Length, between perpendiculars, 165 ft.; breadth, 31 ft.; mean load draught, 11 ft. 7½ in.; displacement at load draught, 805 tons. Her machinery is being constructed by Messrs. J. & G. Rennie, Limited, of London. She will have an I.H.P. of 720 under natural draught, and, when using forced draught, 1,200 H.P., so as to give a speed of 13 knots. The *Goldfinch* will be armed with six 4 in. breech-loading guns, and two 3-pounder quick-firing guns. Her cost, when completed for sea, is estimated at £49,060. The christening ceremony was performed by Mrs. Curtis, wife of Flag-Captain A. C. Curtis, of the *Northampton*, and the religious service was conducted by the Rev. W. H. G. Mann, M.A., vicar of Holy Trinity, Sheerness.

**Inca.**—On May 18th there was launched from the shipbuilding yard of Messrs. William Pickersgill & Sons, Southwick, a handsome iron clipper barge of the following dimensions:—Length, 212 ft.; breadth, 34 ft. 6 in.; depth, 20 ft.; to Lloyd's highest class. She has been built to the order of Messrs. S. Wakeham & Son, of Liverpool, and is the fourth vessel constructed by the builders for the same owners expressly for the South American trade. The captain, officers, and apprentices are comfortably berthed in a cabin aft, and the crew in a large iron house. She is fitted with steel masts and yards, a patent underside windlass, supplied by Messrs. Harfield & Co., of London; one pair of double-chambered patent pumps, by Messrs. Adair & Co., of Liverpool; and two large and powerful hand winches, by Messrs. Rogers & Co., of Stockton-on-Tees. As she left the ways she was named *Inca* by Miss P. Pickersgill. During her construction the vessel has been superintended on behalf of the owners by Mr. R. Richards, of Liverpool.

**Yarta.**—We attended on May 18th, at the invitation of the builders, Messrs. Steward & Latham, of South Dock Ironworks, Blackwall, E., the launch of a finely-modelled steel yacht, constructed by them for Captain Wiggins, of the Army and Navy Club. The symmetrical and very graceful outlines of the yacht were greatly admired as she lay on the stocks, but it was after a most successful launch and when she was fairly afloat in her native element, that she was seen to best advantage, the view of her when water-borne calling forth a general consensus of opinion that she did great credit alike to her builders and to her well-known designer, Mr. A. H. Brown, M.I.N.A., of 10, Pall Mall, S.W. Briefly we may state that the *Yarta*

has a length of 147 ft. 6 in., a beam of 20 ft., and a depth of 10 ft. 9 in., with a yacht measurement of 230 tons, and a total displacement of about 240 tons. She will be rigged as a fore-and-aft schooner, with a large sail over, and has been built of steel throughout to take the highest class at Lloyd's. Her machinery will consist of a set of triple-expansion engines, having cylinders 11 in., 17½ in., and 27½ in. diameter, each with a stroke of 22 in., and driving a four-bladed propeller. Steam will be supplied by a single boiler, fitted with Foxe's corrugated flues, at a working pressure of 160 lb., and when running, so as to give off 250 I.H.P., an estimated speed of 10 to 11 knots per hour will be attained and substantially. The vessel is handsomely fitted throughout, all the deck work being of teak, while the saloon fittings are of oak, all the upholstery being carried out by Messrs. Turner, Lord, & Co., while electric bells are to be placed in all parts of the vessel with which it may be desired to communicate. The launch took place in splendid weather, and was in every way a most successful one, being effected by means of electrical machinery, while the christening ceremony was gracefully performed by Miss Hall, a niece of the owner, Captain Wiggins.

**Glencairn.**—On May 21st Messrs. J. Priestman & Co. successfully launched, from their Castletown yard, Sunderland, a steel screw steamer. Length over all, 240 ft.; extreme breadth, 32 ft.; depth, moulded, 16 ft. 4 in. She is built to the order of Messrs. Robert Livingston & Co., West Hartlepool, and is of the raised quarter-deck type, with long bridge extending to forward of the foremast, to give ample 'tween deck accommodation, and is schooner-rigged. There are four watertight bulkheads, and the hull is built on the web-frame system. Water ballast tanks are fitted in fore and after holds, to contain about 270 tons. The engines have been built by Messrs. Hudson & Corbett, Kelvinhay Works, Glasgow, and are of the triple-expansion type, of about 700 I.H.P. The boiler will have a working pressure of 160 lb. The deck machinery consists of one of Messrs. Harfield & Co.'s windlasses, driven by Messenger chain from forward winch, four horizontal steam winches, and Davis's patent worm gear on top bridge. The patent screw gear aft is by Hastie & Co., Greenock. The vessel, on leaving the ways, was named the *Glencairn* by Miss Kate Livingstone, of West Hartlepool.

#### LAUNCHES.—SCOTCH.

**Loosestrife.**—On April 29th Mr. James Adam, boatbuilder, Cove-road, Gourrock, put into the water a new electric launch, which he contracted to build some months ago for Mr. Goold, of London, from designs by Mr. G. L. Watson. The new launch is the first of her kind constructed in Scotland for a private owner. The dimensions of the vessel, which was named *Loosestrife* by Miss Tina Adam, are as follows:—Length, 50 ft.; breadth, 7 ft.; depth, 3 ft. 7 in. The modelling of the *Loosestrife* shows a cutwater bow and elliptic stern. She is fitted with a house amidships.

**Capua.**—On April 30th Messrs. Alex. Stephen & Sons Linthouse, launched a fine steel screw steamer of the most modern type, and built under special survey to the highest class in Lloyd's. The steamer, which is about 2,100 tons, has been constructed for Messrs. Robt. M. Sloman & Co., of Hamburg, and is the sixteenth vessel built for these owners by Messrs. Stephen, who have a sister ship in hand for them at present. The one launched on April 30th was named the *Capua* by Miss Clara von Essen, daughter of Mr. W. S. von Essen, the superintending engineer of Messrs. Sloman's steamers. The *Capua* is a splendid example of the modern cargo steamer, and is specially adapted to the requirements of Messrs. Sloman's trade between New York and Rio de Janeiro. Her engines are of the most improved triple-expansion type, with cylinders 21 in., 33 in., and 54 in. diameter, by 42 in. stroke, and a working pressure of 160 lbs., and were fitted on board complete before launching.

**Newfield.**—On May 1st a sailing ship, built to the order of Messrs. Brownell & Co., Liverpool, was launched from the yard of Messrs. Alexander Stephen & Sons, Dundee, in the presence of a large number of spectators. The vessel, which was named the *Newfield* by Miss Brownell, is 248.6 ft. long, 35.36 ft. beam, and 21.6 ft. deep in the hold; her register tonnage is a little over 1,300, and her carrying capacity 2,100 tons deadweight. The vessel is most substantially built, and beautifully modelled; her frames are of iron and her plates of steel, and the lower and top masts are of one piece. She will be

fitted with the most improved appliances for working the ship and cargo. Her crew will be accommodated in a commodious deckhouse. Captain Carruthers has been appointed to the command of the *Newfield*, which is to be employed trading to the West Coast of South America.

**Winnie.**—On May 1st there was launched from the Grange-mouth Dockyard Company's shipbuilding yard a handsomely modelled steel screw steamer of 2,700 tons, 280 ft. by 36½ ft. by 19 ft. 5 in., raised quarter-deck, long extended bridge, half poop and topgallant forecabin, with all the latest improvements. The engines, which are of the triple-expansion type, are being supplied by Messrs. Hutson and Corbet, of Glasgow. Both the hull and machinery have been built under Lloyd's special survey for their highest class, and the hull has also been under the superintendence of Mr. J. Petrie and Captain Rodgaard, who will command the vessel. On taking the water she was named *Winnie* by Miss Mattie A. L. Goodwin, granddaughter of one of the owners. The vessel has been built for Messrs. C. Neilson & Son, West Hartlepool. The Dockyard Company have two other vessels in hand for West Hartlepool firms.

**Magdalena.**—On May 2nd Messrs. R. Napier & Sons launched from their shipyard at Govan the second of four steel screw steamers of about 5,300 tons, for the Royal Mail Steam Packet Co., London. These magnificent steamships have been specially designed to meet the requirements of the company's West Indian, Brazil, and River Plate service; and in order to attain a high rate of speed with the greatest economy, the hulls have been built upon fine lines, and the machinery consists of powerful triple-expansion engines of 6,500 H.P., and fitted with all the most modern improvements. The general dimensions are:—Length for tonnage, 430 ft.; breadth, extreme, 50 ft.; depth to spar deck, 33 ft. 4 in.; and built of steel, to class 100 A1 at Lloyd's under special survey. The accommodation for the passengers is of the most luxurious description, and all the details have been carefully considered with special reference to a first-class service in a hot climate. To admit of perfect ventilation, the dining saloon has been placed upon the upper deck, before the machinery, where there is no vibration. The sides of this saloon are finished in polished walnut, with exquisitely carved panels from Florence, and the ends are fitted with artistically designed sideboards, bookcases, &c., and a handsome organ is placed at the forward end. From the saloon doors a double staircase leads to the music-room on the promenade deck, which is finished in birds-eye maple and satinwood, and supplied with a fine piano. On the same landing is a comfortable ladies' boudoir, furnished in the same style as the music-room, and further aft is the first-class smoking-room, fitted in polished mahogany and walnut. The promenade deck, upwards of 200 ft. in length, is entirely reserved for the first-class passengers, while the second class have the poop for their own use; the accommodation for the latter is of a very superior description, but little inferior to the first class. State-rooms for about 200 first and 40 second class are situated on the main deck; they are exceptionally large. Superior accommodation has also been provided for 400 third-class passengers in the after part of the 'tween decks. Refrigerating machinery and chambers have been fitted for a sufficient supply of fresh provisions during the whole voyage. It is worthy of note that the entire passenger accommodation is heated by steam, and that the electric light is fitted in every part of the ship. The most modern improvements have also been introduced for the rapid and noiseless handling of cargo and the efficient working of the ship, including Brown's hydraulic cargo gear, Chadburn's telegraphs, Sir Wm. Thomson's compasses, steam windlass and steering gear, &c. She is coated with Hartman's Rahtjens composition. The ship and machinery have been constructed under the supervision of Mr. Bowers, the company's superintending engineer, with Mr. Shelton as resident inspector, and when completed will be placed under the command of Captain Chapman. Mrs. John Hamilton cut the cord which held the ship, and named her the *Magdalena*, and after the launch the vessel was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Engine Works. The company afterwards adjourned to the model room, where success to the *Magdalena* and continued prosperity to the Royal Mail Co. was duly honoured. Mr. Bowers, the company's superintending engineer, replied. At the same time he proposed "Success to the builders," and in doing so expressed the satisfaction that they had had with the first ship, the *Attrato*, of which the *Magda-*

*lena* and the other two ships building were duplicates, and he had not the slightest doubt that the three vessels now building would do as well as she had done. Mr. James Hamilton replied for the builders.

**Tungue.**—On May 2nd Messrs. Scott & Co., Greenock, launched the first of an order for five steel screw-steamers for the Mala Real Portuguese of Lisbon. The new vessel, which was named the *Tungue* by Miss Dallas, step-daughter of Mr. John Brymner, Greenock, is of the following dimensions:—Length, 225 ft.; breadth, 32 ft.; depth, 19 ft.; and of 1,120 tons gross. She is classed 100 A1 at Lloyd's, and has accommodation for 18 first-class, 12 second-class, and 30 third-class passengers, while she has been built to conform to Portuguese Admiralty requirements, and her 'tween decks are capable of carrying a large number of troops. Messrs. Scott & Co. will supply triple-expansion engines of 1,200 H.P. indicated, the diameter of cylinders 20½, 33, and 54 in. respectively, with a piston stroke of 36 in., and the speed to be 13 knots an hour. The *Tungue* is to be engaged in the African coasting trade. Messrs. Scott & Co. will lay the keel of a 3,300 tons steamer for the same company.

**Jelunga.**—On May 3rd Messrs. William Denny & Bros., Dumbarton, launched a first-class passenger steamer intended for the eastern trade, of 5,200 tons gross register. She will be fitted with Brock's patent quadruple engines by Messrs. Denny & Co., Dumbarton. Miss Julia San Pedro, daughter of Captain Jose San Pedro, named the ship *Jelunga*.

**Caledonia.**—On May 6th Messrs. John Reid & Co., Port Glasgow, launched from their shipbuilding yard the first of the two new saloon river steamers, to run in connection with the Caledonian Gourock Railway service. As the vessel left the ways she was gracefully named *Caledonia* by Miss Williamson, daughter of Captain James Williamson, marine superintendent for the new steamboat service. The *Caledonia* is 200 ft. long, 22 ft. beam, and has depth of 7 ft. 9 in. The interests of the travelling public have been carefully studied during construction of this vessel, and as she has been built under the superintendence of Captain Williamson, whose long experience of river traffic, notably in connection with the *Ivanhoe*, it may be taken that, as far as the comforts of passengers are concerned, this new steamer will be a great success. Her fittings, &c., are very tasteful and elegant. The *Caledonia* is to be fitted by Messrs. Rankin & Blackmore, of Greenock, with diagonal tandem compound surface-condensing engines, and to be supplied with steam by two steel boilers of the Navy type. The vessel will be on her station for the opening of the new Gourock Railway on the 1st of June.

**Gorm.**—On May 14th there was launched from the yard of Messrs. Lobnitz & Co., Renfrew, a steel screw steamer of the following principal dimensions:—Length of keel and forerake, 265 ft.; breadth, 35 ft.; depth, 19 ft. Classed in the highest class of Lloyd's, she is to be fitted with machinery of 1,000 I.H.P. on the triple-expansion principle, constructed by Messrs. Lobnitz & Co. The vessel is built for Mr. L. H. Carl, of Copenhagen, and will be commanded by Captain Martin Carl, who has superintended the construction. On leaving the ways the vessel was named *Gorm* by Miss Sommerville, Reston House, Hamilton, and immediately thereafter was taken into the builders' dock, where she will receive her machinery. This is the eleventh vessel built by Messrs. Lobnitz & Co. for the same owner.

**Janet Cowan.**—On May 14th there was launched from the shipbuilding yard of Messrs. Barclay, Curle & Co., Limited, Whiteinch, a handsome steel four-masted sailing ship, built to the order of Messrs. Robert Shankland & Co., Greenock, for their East India trade. Her dimensions are 310 ft. by 43 ft. 6 in. by 25 ft. 3 in., and she will measure about 2,500 tons register. As she left the ways she was named the *Janet Cowan*, by Miss Shankland, daughter of the managing owner, Provost Shankland, of the Craigs, Greenock. She will be a good addition to the fleet of sailing ships already owned by the above-named firm.

**Megna.**—On May 14th Messrs. William Denny Bros., Dumbarton, launched the steel screw steamer *Megna*, of 1,345 tons gross measurement. She will be fitted by Messrs. Denny & Co., Dumbarton, with Brock's patent quadruple engines, and will be employed in the Indian coasting trade. The naming ceremony was performed by Miss Violet Lockhart Denny, daughter of Mr. J. M. Denny, one of the partners.

**Lady Gwendoline.**—On May 15th Messrs. J. M'Arthur & Co. launched from their yard at Abbotsinch, Paisley, a handsome and beautifully modelled saloon paddle steamer named the *Lady Gwendoline*, which has been built to the order of Messrs. Edwards, Robertson & Co., Cardiff, for passenger traffic on the Bristol Channel. The principal dimensions of this steamer are 210 ft. by 23 ft. by 9 ft. She has a straight stem, elliptical stern, deck saloons forward and aft, promenade deck, bridge amidships, dining saloons under main deck forward and aft, and generally speaking in style, appearance and equipment is similar to some of the best known Clyde saloon passenger steamers. The engines are compound surface-condensing, with two Navy boilers, and are being supplied by Messrs. Bow, M'Lachlan & Co., Paisley. As the vessel left the ways she was named by Miss Isa M'Arthur, daughter of the builder.

**Monte Video.**—On May 16th there was launched from the yard of the Ailsa Shipbuilding Co., at Troon, a steel twin-screw passenger steamer of the following dimensions:—Length, 210 ft.; breadth, 31 ft.; depth to main deck, 11 ft., with promenade and saloon decks all fore and aft. She is divided into six watertight compartments, is schooner-rigged, and will be fitted with hydraulic gear for cargo, steam steering gear, steam windlass, and large accommodation for first and second-class passengers, with all modern appliances for their comfort, including electric light, electric bells, &c. The vessel is built to the order of Captain Climaco Becker, of Montevideo, for the Mensagerias Fluviales Del Plata, has been superintended throughout the construction by Captain Becker, and will be engaged in the River Plate trade. She is to be fitted with two sets of triple-expansion engines, 14 in., 22 in., and 36 in. cylinders, and 24 in. stroke, with a working pressure of 160 lb., by Messrs. David Rowan & Son, Glasgow. As the vessel left the ways she was christened *Monte Video* by Miss Annie Findlay, Welbeck-crescent, Troon.

**Scotia.**—On May 16th Messrs. D. & W. Henderson & Co. Meadow-side, Partick, launched a steamer for Messrs. Henderson Brothers, of the Anchor Line. Dimensions:—310 by 40 ft. 6 in. by 26 ft.; gross tonnage, 3,300; H.P., 1,500. The vessel is fitted with triple-expansion engines, and with all modern appliances for rapid handling of cargo which experience can suggest. The vessel was named the *Scotia*.

**Baron Elibank.**—On May 17th there was launched from the shipbuilding yard of Messrs. Murdoch and Murray, Port-Glasgow, a steel screw steamer of the following dimensions, viz.:—260 ft. by 37 ft. by 23 ft. 8 in.; gross tonnage about 2,000. This vessel has been built to the order of Mr. Hugh Hogarth, of Glasgow, for a general cargo trade, and is fitted according to the Board of Trade regulations for carrying grain. The vessel is fully equipped with all the latest appliances for the rapid loading and discharging of cargo. On leaving the ways she was named the Baron Elibank, and was taken in tow for Glasgow, where her machinery will be fitted on board by Messrs. Duncan Stewart and Co., of London-road Ironworks.

**Nugget.**—On May 17th there was launched from the shipbuilding yard of Messrs. Scott & Co., Bowling, a screw steamer of 450 tons deadweight, built to the order of Mr. William Robertson, 88, Great Clyde-street, Glasgow, and intended for his general coasting trade. The vessel is built considerably in excess of Lloyd's rules for their highest class. The bottom has been specially designed by the builders for carrying heavy deadweight cargoes from the Cumberland ports. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Glasgow. The ceremony of naming the vessel *Nugget* was performed by Miss Jenny Gilfillan, Rosehill, Bowling. The vessel during construction has been under the superintendence of Captain D. M'Pherson.

**Elginshire.**—On May 17th Messrs. Birrell, Stenhouse & Co., launched from their shipbuilding yard at Dumbarton a four-masted steel ship of 2,150 tons register, for the Shire Line of Messrs. Thomas Law & Co., Glasgow. Her dimensions are:—Length, 284 ft.; breadth, 41 ft.; depth, 24 ft. 6 in. She has been built to Lloyd's highest class, with all appliances of the most improved description. The new vessel was named *Elginshire* by Miss Hannah Law, and when completed will load for San Francisco, and will be under the command of Captain Alexander, late of the *Stirlingshire*.

**Empress.**—On May 18th, the Grangemouth Dockyard Co. launched a splendid steel steamship—the first built at Alloa—from the Kellybank Shipbuilding Yard there. The vessel, as

she left the ways, was christened *Empress* by Mrs. Younger, wife of Provost Younger, Alloa. The *Empress* has been built to the order of Messrs. Curwen Brothers, Liverpool, for the new Biscay Steamship Co., and has a registered tonnage of 1,900. It is 240 ft. in length by 38 ft. in breadth, and has a moulded depth of 17½ ft. It is fitted with cellular double bottom for water ballast, and will be furnished with engines of the triple-expansion type by Messrs. Hutson & Corbet, of Kelvinhaugh Engine Works, Glasgow.

**Dalswinton.**—On May 20th Messrs. Robert Duncan & Co., shipbuilders, launched from their yard, at Port-Glasgow, a steel sailing ship of the following dimensions:—Length, 245 ft.; breadth, 39 ft.; depth, 22 ft. 6 in.; 1,700 tons register; built to the order of Mr. T. C. Guthrie, and is the sixth vessel Messrs. Duncan & Co. have built for Mr. Guthrie's Village Line of sailing ships. On leaving the ways she was named the *Dalswinton* by Mrs. Burnett, of Barlogan. When completed she will load at Newport for Sydney. A noteworthy incident in connection with this ship is worth recording. Dalswinton Pond, near Dumfries, is well known as the place where the first attempt was made to propel ships by steam and paddle-wheels, and the yard in which the *Dalswinton* has been built is the same in which the *Comet*, the first steamer, was built.

**Tamar.**—On May 20th Messrs. Napier, Shanks & Bell, of Yoker, Glasgow, launched the steel three-masted sailing ship *Tamar*, which has been built to the order of Messrs. Devitt & Moore, of London, as an addition to their well-known Australian line of packets. The *Tamar* is 287 ft. long, 42½ ft. beam, 25½ ft. moulded depth, and will register 2,000 tons; with a carrying capacity of about 3,260 tons all told. She has been built to Lloyd's highest class, under special survey, with steel deck, covered with pine, steel bowsprit, lower masts and lower top-masts, and, having good lines, is expected to prove a fast sailer. A full poop gives accommodation for the master, officers, and a few passengers, and the equipment throughout is of the most complete and approved description, including steam and hand winches, windlass fitted to be worked by steam and by hand, powerful capstans, and special screw steering gear. At the launch the owners were represented by Captain Brown, who will command the vessel on her maiden voyage to Sydney. The ceremony of naming her was performed by Miss Bell, of 19, Eton Place, Hillhead.

**Merqueder.**—On May 20th the Campbeltown Shipbuilding Co. launched from their yard, at Trench Point, Campbeltown, a handsomely-modelled screw steamer, to the order of Messrs. Mercader é Hijos, San Sebastian, Spain. This steamer has been built under Lloyd's special survey to class 100 A 1, and is fitted with Harfield's patent windlass, Hastie's screw steering gear, &c. Her dimensions are:—223 ft. extreme length; 215 ft. (b.p.) by 31 ft. by 15 ft. She has a raised quarter-deck, bridge house, and topgallant fore-castle. Engines, triple-expansion, 17, 27 and 44 by 33 in. stroke, by Messrs. Lees, Anderson, & Co., Glasgow, to highest class of Lloyd's. Speed expected on trial—light, 11½ knots, and loaded, 10½ knots. The steamer has been finished under the superintendence of Captain Ybarra, who will take the command. The vessel on taking the water was named *Merqueder* by Miss Amelia M. Mackay, Campbeltown.

#### LAUNCHES.—IRISH.

**Lancashire.**—On April 27th Messrs. Harland & Wolff launched a large steel screw steamer from one of the slips at the south end of the Twin Island, Belfast. The vessel, which was named the *Lancashire*, was built to the order of Messrs. Bibby Brothers & Co., of Liverpool, Mr. Arthur W. Bibby and Mr. Frank Bibby being amongst those present at the launch. The dimensions of the new steamer are:—Length, 400 ft.; breadth, 45 ft.; depth, 32 ft.; her gross tonnage being about 3,900. She is built to the highest class at Lloyd's, and has a cellular bottom for water ballast, full poop bridge and topgallant fore-castle, and four steel pole masts. The vessel also has large hatches, and will be provided with very effective steam winches in order to secure quick loading and discharge of cargo. A powerful steam windlass and patent steam steering gear are also fitted; in fact, all the most efficient appliances of a first-class cargo steamer will be found on board. Accommodation is provided for the captain and officers on the bridge-house, the quarters of the crew being situate forward. The *Lancashire* will be fitted with triple-expansion engines of the

most improved type, constructed also by Messrs. Harland & Wolff, and indicating 3,000 H.P. effective. The name of Bibby has been long associated with the ship-building industry carried on at the Queen's Island, the earliest orders to Messrs. Harland & Wolff coming from Messrs. John Bibby, Sons & Co., who for many years were very prominent in steam shipbuilding, and are the relatives of the present firm, and for whom altogether 20 steamers were built on the Queen's Island within a period of 10 years.

**Dunmore Head.**—On May 18th there was launched from the shipbuilding yard of Messrs. Workman, Clark, & Co., Limited, at Belfast, a fine steel screw steamer, called the *Dunmore Head*, built to the order of the Ulster Steamship Co., Limited, Belfast—managers, Messrs. G. Heyn & Sons, Ulster Chambers—for their Baltic and general trades. This is the second steamer built by Messrs. Workman, Clark, & Co. for the above firm, the first being the *Teelin Head*. The dimensions of the vessel are:—Length between perpendiculars, 301 ft. 8 in.; breadth, moulded, 40 ft.; depth, moulded, 22 ft. 4 in.; gross tonnage, 2,270; and carrying capacity of 3,600 tons deadweight. She will be classed 100 A 1 at Lloyd's, and will have the special survey mark in the register book. The *Dunmore Head* is of the well-decked class of steamers, and is one of the largest of this type at present afloat. She is specially designed for carrying large cargoes of grain, having a steel fore-and-aft mid-feather, along centre line of holds to the deck, with suitable arrangements for fitting shifting boards in wake of the hatchways, which completely divides the cargo and adds to the safety of the vessel. She has a long bridge amidships, and a long raised quarter-deck extending from the bridge aft; also a topgallant fore-castle, where the seamen and firemen are berthed. The officers and engineers are accommodated amidships under the bridge-deck, their quarters being spacious and well furnished. The vessel is divided into seven watertight compartments by steel bulkheads, and has a double bottom on the cellular system. She is also provided with a trimming tank aft, which is fitted for carrying cargo. The main and quarter-decks are of steel throughout. The bridge and fore-castle decks are of iron covered with wood. There are three very large cargo holds, with hatches of extra large size, and each hatch has a very complete arrangement of steam winches and derricks for the rapid working of cargo. The windlass and capstan, which are of Harfield's patent, are situated on the fore-castle-deck, and are driven by steam. Harrison's steam-steering gear is fitted and placed on the quarter-deck at the after-end of the engine-room. In an iron house aft a heavy hand-screw steering-gear is placed, which can be used at any time. The steamer will be rigged as a schooner, with two steel masts, and fitted with all the latest improvements. The engines are of the triple-expansion design, with cylinders 22, 36, and 60 in. diameter, all having a piston stroke of 3 ft. 6 in., to indicate about 1,200 H.P.; and two multitubular steel boilers, constructed for a working steam pressure of 170 lb. per square inch. The machinery is being built by Messrs. John and James Thomson, Glasgow. The *Dunmore Head* is the seventh steamer built in Belfast for the Ulster Steamship Company. She will be commanded by Captain John Auld, late of the *Black Head* (s), belonging to the same owners.

#### LAUNCH.—SWEDISH.

**Polhem.**—On April 4th a new steamer was launched from the Södra Varfolt, Sweden. She was built for account of the Gotland Steamship Co., and has been christened *Polhem*. The principal dimensions are:—Length, 130 ft.; breadth, 25 ft.; depth in the water, when loaded, 10½ ft.; the engine will be 90 N.H.P. The steamer has to be ready towards the end of May, and is intended for the home traffic. The Södra Varfolt has further in hand two steamers of 25 N.H.P. each; one is a passenger boat, built for a Finland company, the other is a tug for Linköping.

**SHIPBUILDING TENDERS.**—In the House of Commons, on May 6th, Mr. Broadhurst asked the First Lord of the Treasury whether, in inviting tenders for the shipbuilding in connection with the proposed increase of the Royal Navy, the Government would only communicate with such firms who pay the standard rate of wages to the workmen they employ. Lord G. Hamilton said the Admiralty saw no reason to depart from their usual practice in regard to the tenders for new ships, and they would invite those firms to tender which had tendered before.

## LAUNCH.—GERMAN.

**Kaiser Wilhelm II.**—From the Vulcan Shipbuilding Co. at Stettin there was launched at the beginning of last month the large steamer *Kaiser Wilhelm II.*, the largest vessel but one of the German merchant navy. She is 450 ft. long, 51 ft. broad, and has a depth of 37 ft.; the tonnage is 6,000 register tons. With 25 ft. draught she is calculated to carry 3,700 tons cargo, and will have accommodation for 120 first-class passengers, 80 second-class passengers, and 650 third-class passengers. The steamer will be lighted by 650 incandescent lamps, and is also fitted with arc lamps for work in harbour after dark. The engines are triple-expansion of 6,500 H.P. There are six double-ended boilers, each with four furnaces; each boiler weighs about 50 tons and is intended for a working pressure of 162 lb. per square inch. They will be fitted with appliances for forced draught. The propeller has a diameter of 20½ ft. and is calculated to make 70 revolutions per minute. The speed has been put at 17 knots. With 16 knots the *Kaiser Wilhelm II.* will be able to do the distance between Suez and Adelaide in 21 days; the mail takes five days from Berlin to Suez, making a total of 26 days between Berlin and Adelaide, while the fastest English or French service has hitherto been 30 days, and the German contract is for 35 days. The steamer is built exclusively of German steel, which material has also been used for the engines; she has two funnels, and is rigged as a four-masted schooner.

## TRIAL TRIPS.

**Cape Clear.**—On Thursday, April 18th, the new screw steamer *Cape Clear* left the Tyne on a trial trip. This vessel, which has been built by Messrs. W. Dobson & Co., Low Walker, to the order of Messrs. W. Milburn & Co., of Newcastle, is a very fine steamer, built on the improved well-decked principle, and is of the following dimensions, viz.: Length, 265 ft.; breadth, 37 ft.; depth, moulded, 18½ ft. She is fitted with triple-expansion engines of 950 indicated H.P., having cylinders 20 in., 33 in., 64 in., and a stroke of 39 in.: these have been built by North-Eastern Marine Engineering Co., Wallsend. During the trial the engines worked with perfect smoothness, and without a hitch of any kind, and gave every satisfaction to all concerned.

**Don.**—On April 20th this steamer, belonging to the R. M. S. P. Co., which has been in the hands of Earle's Shipbuilding and Engineering Co., undergoing a thorough overhaul, besides being fitted with new boilers and triple-expansion machinery, had her official trial in Stokes Bay, and ran the measured mile four times, when a mean result of 16·704 knots was attained, one run giving a speed of 17·391 knots. Her machinery consists of a set of three-crank engines, having cylinders 40 in., 63 in., and 96 in. in diameter, by 54 in. stroke, and eight steel boilers, made for a working pressure of 150 lb. per square in.

**Conqueror.**—The steam yacht *Conqueror*, built by Messrs. Russell & Co., Port-Glasgow, for Mr. W. S. Bailey, commodore of the Royal Yorkshire Club, left the Clyde on a recent date for Hull, the headquarters of her owner. The *Conqueror* is a craft of 526 tons, being 118 ft. long, 24 ft. 6 in. broad, and 15 ft. 2 in. deep, moulded. The main engines, which are of the tri-compound surface-condensing type, have been constructed by Messrs. William King & Co., Dock Engine Works, Glasgow. The diameters of the cylinders are 15½ in., 24 in., and 40 in. respectively, with a stroke of 33 in. Steam is generated in two steel boilers 13 ft. in diameter, and working to a pressure of 160 lb. to the square in. On trial the I.H.P. was 750, and the speed attained was 13 knots per hour. Mr. William Connal, Glasgow, personally superintended the designing and building of the vessel.

**Rugby.**—On April 27th the new steam trawling vessel *Rugby*, was taken on her trial trip. She has been built by Earle's Shipbuilding and Engineering Co. to the order of Mr. G. F. Sleight, of Grimsby, and will be worked by Mr. William Grant, of that port. The dimensions of the vessel are 87 ft. by 20 ft. by 10 ft. 6 in., and the engines are of the compound type, having cylinders 17 in. and 32 in. diameter by 21 in. stroke, with a large steel boiler to work at 90 lb. pressure. The steam winch is of Earle's special type for trawlers, and a capstan, revolving bollards, and trawl ports, and rollers on both sides are also provided. The compasses having been adjusted by

Mr. Olsen, of Grimsby, the ship proceeded to Grimsby, where she was joined by Mr. Sleight and a party of friends. The *Rugby* was then put to sea for a run on the measured mile off Withernsea, the result being a mean speed of upwards of 9½ knots, which was considered very satisfactory, and the machinery worked admirably throughout the day without the slightest hitch of any description.

**Suffolk.**—On April 27th this new steel screw steamer, having been completed by her builders, Messrs. Ramage & Ferguson, Leith, went on her official trial trip on the Firth of Forth. The *Suffolk* has been built for the old-established and well-known firm of Messrs. Money, Wigram & Sons, Limited, London, and her principal dimensions are:—Length, K. and F., 330 ft.; breadth, moulded, 41 ft.; and depth, moulded, 29 ft. Her engines are triple-expansion, with cylinders 25½ in., 41 in., and 67 in. diameter, by 42 in. stroke, supplied with steam by three steel boilers, working up to 160 lb. pressure. The deadweight capacity all told is about 4,400 tons, and on the trial trip a speed of 11½ knots was attained on the measured mile. A numerous company of shipowners and others interested in the vessel were on board, and the utmost satisfaction was expressed by all with the new steamer's performance.

**Astral.**—On April 27th the steamship *Astral*, built by Messrs. Palmer & Co., Jarrow, left Jarrow on her trial trip. The vessel's length between perpendiculars is 280 ft.; breadth, moulded, 38 ft.; depth, 26 ft. 6 in. She is rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. She is of the spar-deck type, and is fitted with tanks for carrying petroleum oil. The vessel's carrying capacity is 2,700 tons, and is lighted with electricity throughout. She ran 10 knots an hour over the measured mile.

**Brandenburg.**—On April 29th the screw steamer *Brandenburg*, belonging to the Liverpool and Maranham Steamship Co., of which Mr. Hugh Evans, of Preeson's Row, is the founder and managing owner, went on her trial trip. This vessel, the contract for which throughout has been with Messrs. David Rollo & Sons, of Fulton Engine Works, is of the following dimensions, viz., 260 ft. long, 35 ft. broad, and 22 ft. deep. She was built by Mr. Charles J. Bigger, of Foyle Shipyard, Londonderry, in accordance with the passenger vessel requirements of the Board of Trade, Lloyd's Registry, and the Bureau Veritas for 100 A 1 class, and has been fitted and furnished in the very best style for the accommodation of fifty saloon passengers. She has electric lighting apparatus throughout, and her saloon appointments, ventilating and sanitary arrangements are equal to anything to be seen in the largest floating palaces. The engines are of the triple-expansion type, and have been constructed by Messrs. Rollo to indicate 1,300 H.P. To obtain this power they have cylinders 23, 27, and 59 in. diameter by 42 in. stroke, and one double-ended steel boiler 15 ft. diameter, by 17 ft. long, having six of Fox's patent corrugated furnaces 3 ft. 8 in. mean diameter, made for a constant working pressure of 150 lb. per square in. The electric machinery is by Messrs. Clarke, Chapman, Parsons & Co., of Gateshead-on-Tyne, who are also the makers of the steam winches and steam capstan supplied to the vessel. The whole of the work in connection with ship and engines has been done to the plans and specifications and under the supervision of Mr. Gilbert S. Goodwin of this city, and the manner in which it has been carried out reflects the utmost credit upon that gentleman and his assistant, Mr. Hamilton. The engines ran smoothly at 85 revolutions per minute, and 1,400 I.H.P., the vessel attaining a mean speed of 13½ knots per hour. There was a large party of the owner's friends, including a number of ladies, on board, and all expressed themselves as highly satisfied with the vessel and her performance. Among those present were Messrs. Hugh Evans, Austin Taylor, D. Rollo, G. Rollo, G. S. Goodwin, Ed. Ellis (Bureau Veritas), Peebles (Board of Trade), O. H. Williams, R. R. Bevis (Laird Bros.), Kirke, Crooks, Milner (Lloyd's), Hamilton, Roughton, Weir, Captain Roach, &c. After luncheon in the saloon, Mr. Rollo proposed the health of the owners, and success to the *Brandenburg*. He said, speaking on behalf of himself, and also for Mr. Bigger, that they were very glad to have so successfully accomplished their first work for Mr. Evans. Mr. Evans, in reply, thanked Mr. Rollo, and said that his original boats, the *Brinswick* and the *Braganza*, had been built by Messrs. Laird Bros., and had given great satisfaction by their unequalled performance and clockwork regularity. He felt sure that the *Brandenburg* would give equal satisfaction, and reflect equal credit on the builders, whose health he then proposed. This toast was seconded by Mr.

Austin Taylor, and responded to by Mr. Rollo and Mr. Pollock, on behalf of Mr. Bigger. Other toasts were "Mr. G. S. Goodwin," "The Naval Architect," "The Trade," and "The Ladies."

**Trevorian.**—On April 29th the screw steamer *Trevorian*, built and engined by Messrs. John Readhead & Sons, South Shields, left the Tyne, and after undergoing her trial proceeded direct for Cardiff, where she is to load a cargo of coals for Port Said. The *Trevorian* is a steel vessel 290 ft. in length between perpendiculars, 80 ft. broad, and with 20 ft. depth of hold. She is built on the improved well-deck system, and carries water ballast in cellular bottom fore and aft, her deadweight carrying capacity being 3,450 tons on a mean draught of water of 20 ft. 6 in. The steamer is fitted with winches and shifting boards, bulkheads, &c., as required by the Grain Cargoes Act. She has triple-expansion engines, the cylinders being 28, 37½, and 61½ in., by 39 in. stroke, and steam is supplied by two large steel boilers, fitted with Purvis's patent furnaces and patent Venetian fire bars. The trial proved most satisfactory, the engines, which are of 250 H.P. nominal, working smoothly and steadily, and enabling the vessel to maintain a speed of 11 knots in her runs over the measured mile. This is the seventeenth vessel which Messrs. John Readhead & Sons have turned out for the owners, Messrs. C. Hain & Sons, of St. Ives, Cornwall, and they have in course of construction another steamer for the same firm.

**Sovereign Queen.**—On April 29th the trial of the new steamer *Sovereign Queen*, built by Messrs. Barclay, Curle & Co., Whiteinch, for the Isle of Wight and Southampton Royal Mail Steam Packet Co., took place over the measured mile at Garelloch, when a mean speed of 16½ miles per hour was attained. This is considerably over the speed guaranteed by the contract. The vessel, which is 215 ft. in length by 21 ft. beam and 8 ft. 6 in. deep, has been built to replace the paddle steamer *Princess of Wales*, which was lost last year on her trial trip on the Clyde. She is fitted with compound engines, steam windlasses, and steam capstan aft to facilitate the working of the vessel. The trials took place in presence of Captain Short, Mr. Brown, and the representatives of the company, who expressed themselves as being highly pleased with the result.

**Isle of Iona.**—On April 30th the new screw steamer *Isle of Iona* left Shields on a trial trip. This vessel, which has been built by Messrs. T. and W. Smith, South Shields, to the order of Messrs. Dixon, Robson and Co., Newcastle, the owners of the well-known "Isle" Line of Steamers, is a very fine and handsomely modelled vessel, with the following dimensions, viz.:—Length, 225 ft.; breadth, 33 ft.; and draught, 15 ft. 9 in. She is built entirely of iron, no steel at all being used in her construction. She is fitted with triple-expansion engines by the North-Eastern Marine Engineering Co., Wallsend, having cylinders 16½, 27, 44, with a stroke of 33 in.; steam at 100 lb. pressure is supplied by a large single-ended boiler 13½ ft. diameter and 10 ft. long. The vessel steamed out to sea for three hours and then returned to the harbour, and during this run the engines were kept running at 87 revolutions without a single stoppage or hitch of any kind whatever, giving great satisfaction to all concerned. The speed realised during the run was 12½ knots, which was considered highly satisfactory.

**Transit.**—On Tuesday, April 30th, the screw steamer *Transit*, which has been built by Messrs. Wood, Skinner & Co., Bill Quay, to the order of Mr. W. Wilhelmsen, of Tonsberg, left the river on a trial trip. This steamer, which is an exceedingly handsome vessel, is built of steel and to the highest class at Lloyd's, and also under the inspection of the Norwegian Veritas. She has a carrying capacity of about 2,500 tons, and is of the following dimensions, viz.:—Length, 250 ft.; breadth, 35 ft.; draft, 16 ft. 3 in. The machinery, which is supplied by the North-Eastern Marine Engineering Co., Limited, Wallsend, is of the triple-expansion type, having cylinders 18½, 30, and 49 in., and a stroke of 33 in., and including all the latest and most modern improvements. During the trial the engines worked without any hitch or stoppage of any kind, giving every satisfaction to all concerned. During construction the ship and machinery have been inspected by Captain Foss on behalf of the owners, and by Mr. Bodin on behalf of the Norwegian Veritas.

**City of Canterbury.**—On May 2nd the s.s. *City of Canterbury*, one of Messrs. George Smith & Sons' line of Calcutta steamers, left the Clyde for Calcutta, via Liverpool, after being fitted by Messrs. James Howden & Co., of Glasgow, with new triple-

expansion engines and boilers on their well-known forced-draught system. The new engines have cylinders 25 in., 42 in., and 68½ in. diameter by 48 in. stroke, which are supplied with steam at 160 lb. pressure from two single-ended boilers, each 14 ft. 3 in. diameter by 11 ft. 6 in. in length, having three furnaces each 3 ft. 6 in. diameter, the aggregate fire-grate of the two boilers being 90 square ft. The *City of Canterbury*, with her cargo on board, went down the river early in the morning and had her compasses adjusted. She was thereafter joined by Mr. George Smith and friends from Glasgow, for the purpose of testing the new machinery by a run down the Channel. This was accomplished to the entire satisfaction of all on board, the engines working admirably, and an ample supply of steam being easily provided by the forced-draught boilers, which are sufficient for 2,000 I.H.P. With 1,800 I.H.P. a very satisfactory mean speed of 12·8 knots was maintained. After landing the party from Glasgow, the steamer proceeded on her voyage. The *City of Canterbury* is the third steamer of this line fitted with Howden's forced-draught system, which, after upwards of two years' trial in the *City of Venice*, has given the highest results in economy and efficiency. Messrs. George Smith & Sons are having their new steamers fitted with Howden's forced-draught system.

**Circassian Prince.**—On May 4th the screw steamer, *Circassian Prince*, went out on trial. The vessel has been built for carrying petroleum, by Messrs. C. S. Swan & Hunter, Wallsend-on-Tyne, for James Knot, Esq., Newcastle. The dimensions are—280 ft. long over all, by 38 ft. beam, by 27 ft. 3 in. depth, moulded, and the vessel is built of Sieman's-Martin steel to highest class at the Bureau Veritas, specially for carrying petroleum in bulk, being sub-divided by longitudinal and transverse bulkheads into numerous compartments, with continuous expansion tanks in 'tween decks for controlling the liquid cargo. Two large special oil pumps, each capable of discharging 150 tons per hour, with a double range of pipes for loading or discharging each tank independently. The vessel is also fitted throughout with electric lights, two steam winches, direct steam windlass, and all the most modern appliances. The engines are by the North-Eastern Marine Engineering Co., Wallsend-on-Tyne; triple-expansion boilers, fitted with forced draught, on the closed ashpit system. Progressive speeds were taken, the average speed with forced draught being 10 knots, which was considered very satisfactory. The trial trip was attended by Captain Milburn, Captain Jones, Mr. Lunn and Mr. Maccoby, representing Mr. Knot, Mr. Alderman Kent, Mr. Alderman McDermot, and a large party of ladies and gentlemen.

**Pladda.**—On May 4th the steamer *Pladda*, recently built and engined by Messrs. W. B. Thompson & Co. for the Clyde Shipping Co., of Glasgow, went down the Tay for a trial trip. Leaving the Camperdown Jetty shortly before noon, the vessel was soon outside the Abertay Lightship, where the compasses were adjusted. Thereafter the *Pladda* re-entered the Tay, and ran the measured mile with and against the tide, the mean result giving a speed of between 12 and 13 knots, the machinery working with exceptional smoothness.

**Euxine.**—On May 6th the new steel screw tug *Euxine*, built to the order of Messrs. Stathatos Bros., of Braila, for service on the Danube, had her official trial trip, and it was in every respect satisfactory, the speed attained on the measured distance being 11½ knots, or over 13 miles per hour. The dimensions of the *Euxine* are 115 ft. by 20 ft. by 11 ft. The engines, of the triple-compound type, are of 75 N.H.P., having cylinders 14 in. 28 in., and 37 in. in diameter by 24 in. stroke. The engines are supplied with steam by one large steel boiler, working at 150 lb. pressure. The contractors for the boat are Messrs. J. B. Rennoldson & Sons, of South Shields, who have equipped the vessel and supplied the vessel and supplied the engines, the steel hull having been built by Mr. J. T. Eltringham, Stone Quay.

**Khio.**—On May 7th the new steamer *Khio*, recently built for Messrs. The Pinkney & Sons Steamship Co., Limited, of Sunderland, by Messrs. Edward Withy & Co., West Hartlepool, and engined by Messrs. T. Richardson & Sons, Hartlepool, had a most successful trial trip. It will be remembered that we called our readers' attention to the smart work that was done by Messrs. T. Richardson & Sons, in putting in the machinery of this vessel in 3½ working days, and the result of her speed trial clearly proves, that with an intelligent staff of workmen, quick work can also be very efficient. The vessel in her continuous steaming averaged 11½ knots, and at one portion of the

trial trip she steamed 12½ knots. A large party of gentlemen were on board, including Captain Collings and Mr. Smith representing the owners, and Mr. G. W. Sivewright representing the builders. The engines were in charge of Mr. Robinson, with a staff of engineers from the engine builders.

**Magicienne.**—On May 7th the *Magicienne* made another trial of her engines at Portsmouth under forced draught. Since the last trial various alterations had been introduced. With a view of enabling steam to be generated and utilised, modifications had been made in the combustion chambers of her double-ended boilers, while, to relieve the back pressure in the low-pressure cylinders, an additional outlet for the exhaust steam had been fitted, and its passage to the condensers facilitated by removing several of the tubes. But all apparently to no purpose, as the maximum power developed during any half-hour was 8,100, the contract being 9,000 horses, after which the power steadily declined to the end of the run, which was arrested before the expiration of the four hours. The engines themselves worked well, and when they were at their best a speed of 18½ knots was realised.

**Deddington.**—On May 11th this vessel, built by Messrs. Priestman & Co., of Sunderland, for Mr. Henry Sansman, of Hull, under the superintendence of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, was taken for trial at sea, having on board about 1,100 tons deadweight. She is 280 ft. long, 39 ft. beam, 20 ft. 3 in. moulded depth, and fitted with long bridge, poop, and forecastle. She will carry 3,100 tons deadweight and draught of 18 ft. 6 in., and has been specially designed for ports where light draught of water is necessary. She is built to Lloyd's highest class, and has strong bridge and other requirements for reduced freeboard, and iron shifting boards are fitted the entire length of the vessel. She is fitted with Emerson Walker's windlass, Davis' steam steering gear, with double screw gear aft, and powerful winches for quick discharge, and proved herself easily handled at sea. Her machinery, by George Clark & Co., is of the triple-expansion type, with cylinders 21 in., 35 in., and 57½ in. diameter, by 39 in. stroke, supplied with steam of 160 lb. pressure from two large boilers, 3,200 ft. of heating surface, and is fitted with all modern improvements for quick handling and economy. Feed water-heater, distiller, and air-extractor of Machaine's type, are fitted for making and heating fresh water. The owner and a party of gentlemen attended the trial, which was most satisfactory, the machinery working without the slightest hitch during a progressive trial, and driving the ship 11 knots upon the full power runs.

**The Redruth.**—On May 11th this vessel, built by Palmer's Shipbuilding and Iron Co., Limited, and launched a few weeks ago from their building yard at Howdon, was taken out on her compass-adjusting and trial trip. The *Redruth* is a steel screw steamer, whose length between perpendiculars is 285 ft.; breadth, moulded, 39 ft.; depth, moulded, 23 ft. The vessel is rigged as a two-masted schooner, and is classed 100 A 1 at Lloyd's. The accommodation for the captain and officers is provided in a sunk poop aft—that for the engineers at the after end of the bridge, and for the crew at the fore end. Water ballast is provided for in a double bottom throughout the holds, and in tanks in the fore and aft peaks. Clarke, Chapman, & Parson's direct steam windlass is fitted on the main deck forward, Davis' steam-steering gear amidships, and Hastie's screw gear aft. The compasses were supplied by Mr. J. J. Wilson, of Sunderland, and on the trial were speedily adjusted by Mr. J. W. Gillie. The vessel is built to carry 3,600 tons deadweight, and is specially fitted up with strong timbering the whole length of the ship amidships, reaching from the upper deck to the bottom of the hold, in order that the grain—for the carrying of which she has been specially constructed—may be kept from shifting. The engines, which are of the triple-expansion type, were also supplied by the Palmer Co., and during the four hours of uninterrupted trial worked with remarkable ease, regularity, and coolness in every bearing. The steam is supplied by two large steel boilers, the six furnaces for which are fitted up with the Venetian air-valve furnace-bar (Galley's patent). The ship has been built to the order of Messrs. John Cory & Sons, Cardiff. The hull was superintended by Captain Tracoe, commodore of Messrs. Cory's fleet, and who 35 years superintended the first ship built by the Messrs. Palmer for the company. As the ship was merely in ballast, and the propeller immersed, no run was made over the measured mile. The trial, however, gave every satisfaction.

**Euphrosyne.**—On May 11th the steam yacht *Euphrosyne*,

launched from the yard of Messrs. Camper & Nicolson, of Gosport, and engined by Messrs. W. B. Thompson & Co., Dundee, ran the measured mile in the river Tay, when a speed of 11 knots was attained, the engines developing 300 H.P. The *Euphrosyne* has been built for Mr. W. J. Pawson, of Northumberland, and her dimensions are:—Length, 130 ft.; beam, 19 ft. 3 in.; depth, 9 ft. Her engines are triple-expansion—Thompson's patent—the cylinders being 12 in., 17 in., and 30 in.; stroke, 20 in. Steam is supplied from a steel boiler at a pressure of 150 lb. per square in.

**City of Belfast.**—On May 16th the new screw steamer *City of Belfast*, built by Messrs. Short Brothers to the order of the City of Belfast Steamship Co., Limited, of Belfast, went out on her trial trip. After adjusting compasses the vessel was put on the measured mile, when a mean speed of 11½ knots was obtained over a series of runs. The dimensions are:—Length, 292 ft.; breadth, 39.1 ft.; depth, 19.25 ft.; with a deadweight capacity of about 3,200 tons on Lloyd's freeboard. The engines, which are of 180 N.H.P., and have been fitted by Messrs. Thomas Richardson & Sons, Hartlepool, worked very smoothly, gave every satisfaction, and developed a high indicated power. The cabins are handsomely fitted up in polished hardwood, and the vessel is lighted up throughout with the electric light, and has powerful lights at each hatchway and hold, to enable the cargo to be worked at night. The side and masthead lanterns are also fitted with electric light. The vessel is commanded by Captain Brady, late of the Ulster Steamship Co., Limited. After the trial the vessel put into Blyth, where she will take her first cargo for Alexandria.

**Thornaby.**—On May 16th the new steel steamer *Thornaby*, just completed by Messrs. Ropner & Son, Stockton-on-Tees, had her trial trip from the Tees. After taking in bunker coal at Connal Wharf, she steamed down the river into the bay, where her compasses were adjusted, after which a long run was made, when everything was found to work satisfactorily, a speed of over 10 knots being attained. This steamer forms one of Messrs. R. Ropner & Co.'s fleet; she has been built under the supervision of Captain Rooke, their marine superintendent, and will carry 2,600 tons deadweight; the engines and boilers are by Messrs. Blair & Co., Limited. The steamer afterwards proceeded on her voyage to Cardiff, where she will load for Port Said.

**Piemonte.**—On May 17th the official trials of the Italian cruiser *Piemonte*, built by Messrs. Armstrong, Mitchell & Co., and engined by Messrs. Humphrys, Tennant & Co., were brought to a successful termination. This vessel is the latest of the protected cruiser class built by the same firm, the list including the *Esmeralda*, built in 1892-3 from the designs of Mr. George Rendel, and the *Dogali*, built in 1896 from the designs of Mr. W. H. White. The natural draught endurance trial consisted of a run of six hours, and the mean speed attained was 20.4 knots. The forced draught run gave a mean speed on the measured mile of 22.3 knots, the engines working at about 185 revolutions and without any signs of heating. The ship was at her load draught, ballast having been added to represent armament.

**Rosary.**—On May 22nd this new steel screw steamer, just completed for Messrs. Harris & Dixon, shipowners, Gracechurch Street, London, by Messrs. Ramage & Ferguson, Leith, went on her official trial trip in the Firth of Forth, and on the measured mile attained a mean speed of 11.7 knots on four runs, which was considered eminently satisfactory by all concerned. The *Rosary's* tonnage, gross, is 1,112 tons, the dimensions being 230 ft. R. + F. by 32 ft. by 16 ft. 4 in. M.d. and the engines are triple-expansion, having cylinders 20 in., 33 in., and 54 in. diameter by 36 in. stroke, supplied with steam at 160 lb. from two steel boilers. Her framework is of iron plated with steel, with poop, quarter-deck, long bridge, and topgallant forecastle, all constructed to the highest class at Lloyd's.

**The Regulus.**—On May 22nd the screw steamer *Regulus*, built to the order of the Finska Angfartygs Actiebolagst, of Helsingfors, by Messrs. Osbourne, Graham & Co., of Hylton, and fitted with tri-compound engines of the most improved pattern by the North-Eastern Marine Engineering Co., of Sunderland, was tried at sea with excellent results, attaining a speed over the measured mile of 10 to 12 knots, according to wind and tide, with 79 revolutions, on a very moderate consumption of fuel.

**Ponani.**—The *Ponani*, a new screw steamer owned by the Bombay Steam Navigation Co., has lately left the Clyde

for Bombay, from which port she will trade. She was built by the Whitehaven Shipbuilding Co., and is of the following dimensions: 180 ft. by 29 ft. by 19 ft. 6 in. to awning deck. She has extensive accommodation for native passengers. Messrs. Dunsmuir & Jackson, Govan, supplied the propelling machinery, which is of the triple-expansion type, with cylinders 16 in., 26 in., and 40 in. in diameter, and adapted to a piston stroke of 30 in. One single-ended boiler, 18 ft. 6 in. in diameter and 10 ft. 6 in. long, supplies steam. There are three furnaces 3 ft. 4 in. in diameter. The heating surface is 1,591 square ft.; grate surface, 56 square ft.; and condensing surface, 923 ft. The boiler has brass tubes, and is worked under forced draught on the closed stokehold system, a 5 ft. 6 in. fan, and engine being supplied by Messrs. Tangye. On trial on the Firth of Clyde the speed attained was 10 knots, the vessel having 820 tons deadweight on board, the draught forward and aft being 12 ft. 6 in. and 14 ft. 6 in. respectively. The engines made 112 revolutions, and the pressure in the boiler was 160 lb. to the square in. The power was 915 I.H.P. The cargo is to be worked by hydraulic machinery. Messrs. Fullerton, Hodgart, & Barclay, Paisley, having provided compound surface-condensing engines for this purpose.

**Modjeska.**—On May 8th the twin-screw steamer *Modjeska*, recently launched by Messrs. Napier, Shanks & Bell, went upon her official trial trip, when the result was highly satisfactory. The *Modjeska* is a steel twin-screw steamer, specially designed and built to the order of the Hamilton Steamboat Co., Ontario, for passenger service on Lake Ontario, and specially between Hamilton and Toronto, it being intended, from the high rate of speed promised by the builders, to make two runs each day during the season between these important towns. The necessity of passing through a series of canals in order to reach her destination, limited the length of the steamer to 185 ft. over all. Her breadth at main deck is 30 ft., and at water line 25 ft.; depth, moulded to main deck, 13 ft.; and gross tonnage, 500 tons. The general arrangements of the vessel are of the American type, embracing main and promenade decks the whole length of the vessel, with a permanent wood awning above all, extending from the foremast to the stern. The hull, of Siemens-Martin steel, has fine lines, more resembling those of a yacht than a merchant vessel. Passenger accommodation being the essential requirement, the whole of the decks and deckhouses are devoted to this, the dining saloon being placed on the lower deck at the after end, and easily accessible from the upper saloon by a wide and handsome stairway. Electric light is fitted throughout the vessel, and this will enable passengers to enjoy the evening trips, which are regarded as a special feature in the American lake service. The installation has been fitted up by Messrs. Paterson & Cooper, of Glasgow and London. There are 100 lights in all, and the current is generated by a Phoenix dynamo and a vertical engine of 12 H.P. The globe fittings in the saloon for enclosing the lights are of a very chaste and attractive design. The machinery, by Messrs. Dunsmuir & Jackson, consists of triple-expansion engines of the most approved type, fulfilling all the requirements of the British Board of Trade, together with the special requirements of the Canadian navigation laws. After leaving Greenock, the *Modjeska* was run down almost to the Clech Lighthouse, and afterwards cruised about in that part of the Channel for a couple of hours to enable those interested to judge of her steering powers. She was afterwards taken twice over the measured mile at Skelmorlie, when a mean speed of 16½ knots was attained, being in excess of contract, and giving perfect satisfaction to all concerned.

**New Lifeboat for India.**—On May 8th a new lifeboat, built to the order of the Indian Government, was successfully tried in the East India Docks. The vessel is 39 ft. long by 9 ft. 6 in. beam. She has been constructed on the self-righting principle, and is fitted with an iron drop keel, as she will be principally used for sailing. The boat has been built under the supervision of the Royal National Lifeboat Institution, and will be the first lifeboat placed on the coast of India. The tests to which she was subjected were of the most extreme description. She was first loaded with all her oars, anchor, cables, masts and sails, and every fitting that such a boat would carry in going off in a heavy sea, in addition to which the deadweight of 16 men of 11-stone each, was lashed to the thwarts. The boat was then turned bottom upwards, when she immediately righted herself, and by means of her relieving valves emptied herself of water in 46 seconds. She was then turned over with her masts and sails set, when she immediately righted herself in the same satisfactory manner. As a test of her stability she was

then loaded by having the weight of 28 men placed on her gunwale, in addition to the crew of 16 men, the boat being also full of water. This only just brought her gunwale to the water's edge. Without doubt a lifeboat with such qualities would seem to be capable of undergoing any duty in the most severe gale with perfect safety. The boat has been built by Messrs. Watkins & Co., of Blackwall, builders to the Royal National Lifeboat Institution, and was tested under the supervision of Captain Nepean, R.N., assistant inspector to the Royal National Lifeboat Institution.

**Lumen.**—On May 8th the steel screw steamship *Lumen*, built especially for carrying petroleum in bulk on Mr. F. H. Swan's expansion-tank principle, was tried at sea, with results that gave entire satisfaction to the owners, the builders, and the engineers. The *Lumen* was built by Sir W. G. Armstrong, Mitchell, & Co., Limited, at their Low Walker establishment, to the order of Messrs. H. E. Moss & Co., shipowners, of Liverpool, London, and Newcastle. Her dimensions are:—Length, 304 ft.; breadth of beam, 37 ft. 9 in.; and depth 27 ft. 9 in.; whilst her carrying capacity is estimated at 3,500 tons. The engines are of the triple-expansion type, and were built by the Wallsend Slipway Co., having cylinders of 21 in., 35 in., and 57 in., with a 36 in. stroke, working at 160 lb. pressure. Steam is supplied by two boilers, worked by Fox's patent furnaces, to which the Wallsend Slipway Co. fitted their admirable arrangement of the ashpit draught. She is fitted throughout with the electric light—this department having been under the care of the Woodside Electric Lighting Co., of Glasgow. The oil pumps are of the Worthington make, and their delivering capacity is over 300 tons per hour. There were present on board at the trial, amongst others, Mr. F. A. Tamplin and Mr. E. A. Cohan, of the firm of Messrs. H. E. Moss & Co., to whose order the vessel was built, under the superintendence of Mr. A. G. Schaeffer, consulting engineer and representative of the Bureau Veritas at Newcastle; Mr. L. Macarthy, of the Clapham Steamship Co., Newcastle; Mr. F. E. Irwin, consulting engineer, Liverpool; Mr. William Boyd, managing director of the Wallsend Slipway Co.; Captain John West Brown, who will take command of the ship; Mr. T. C. Bullen, manager of Messrs. H. E. Moss & Co.'s house at the Quayside, Newcastle; and Mr. A. Guleston, inspecting engineer, representing Sir W. G. Armstrong, Mitchell & Co. The vessel made her run over the measured mile, attaining a mean speed of 10½ knots per hour, which is a knot above the rate guaranteed in the contract, and this with the ship fully loaded. Afterwards the coal consumption trial was made, the result showing 1.3 lb. I.H.P. Mr. T. Taylor was during the trials in charge of the engines as the representative of the Wallsend Slipway Co.

**Magpie.**—On May 9th there was taken down the Channel (off Plymouth) on her trial trip, H.M.S. *Magpie*, the first of three ships which have been constructed at Pembroke, and engined by Earle's Shipbuilding and Engineering Co., Limited, Hull. These are single screw composite vessels of 865 tons, and belong to what is known as the *Bird* class, and the machinery consists of a set of triple-compound, three crank, high speed marine engines, with cylinders 20 in., 30 in., and 45 in. in diameter, by 24 in. stroke, these being supplied with steam at 145 lb. pressure from the two double-ended steel boilers of the *Navy* type. The run was continued for twelve successive hours without intermission, and during the whole of this time there was not the slightest hitch and the machinery worked splendidly, the result being a mean power of 882 I.H.P., nearly 25 per cent. in excess of what was guaranteed. On Saturday, May 11th, the *Magpie* was again taken out for the four hours trial under forced draught, and developed an average of 1,298 H.P., which was 92 I.H.P. in excess of the contract, and was considered highly satisfactory by the Government officials on board.

**The Undia.**—On May 9th the new steam fishing ship *Undia*, built by Messrs. Cook, Welton & Gemmell, of Hull, to the order of Messrs. Letten Brothers, for the Union Steam Fishing Co., had her trial trip. The vessel is 110 ft. long, 20 ft. 6 in. beam, and 11 ft. 6 in. deep. She is classed 100 A 1 at Lloyd's, with scantlings in excess. The engines, 50 H.P. triple-expansion, have been built by Messrs. T. B. Holmes & Co., of Hull. The vessel is designed for line fishing, but is fitted for trawling if required, and is built and fitted on the best known principles, and provided with all the latest improvements. The sailing qualities of the ship were considered very satisfactory, the average speed maintained being found to be 9½ knots.

## Reviews.

"The Electrician" *Electrical Trades Directory and Handbook for 1889.* London: "The Electrician" Printing and Publishing Co.

To attempt to systematically classify all the branches of one particular industry when the branches are dispersed all over the Kingdom, is no light task, but when to this is added the classification of all the branches scattered in foreign and colonial countries then the task assumes more than ordinary dimensions and involves labour of no ordinary measure.

In the directory now under notice, the names of all those engaged in the trade it represents have, so far as possible, been gathered together from all corners of the earth, and are duly set forth in its pages, each under the proper headings and sub-headings. In addition to this gathering together of names, the enterprising publishers have also enriched their book by a pictorial representation (in the way of reproduced photographs) of many of the leading lights of the profession, and as these portraits are also accompanied by a brief sketch of the career of the individuals they represent, their interest is enhanced. We are pleased to see that year by year the proportions of the directory have steadily increased, until in this, the seventh year of its publication, it has assumed the proportions of a portly tome, thereby indicating, we take it, that so far as trade is concerned, the electrical profession has not by any means stood still.

The tables relating to electrical data have been compiled with special care, and several valuable additions have been made to them, while those connected with trade, commerce, and international relations have also been corrected and considerably enlarged.

Taken altogether the book appears to us to worthily meet the requirements of a numerous and rapidly-growing profession to whose interests it is devoted.

*Pumps: their History and Construction.* By Philip R. Björling. Manchester: Emmott & Co.

THE author has reprinted, in pamphlet form, two lectures delivered by him at the School of Art, Gloucester. The value of the present little book may be best estimated from the fact that in the lectures he dealt thoroughly and exhaustively with the whole history of pumps, from the remotest date to the present day, and equally thoroughly, but rather typically than exhaustively, with the various methods of constructing these most useful engines.

Though, of course, the exigencies of the lecture-hall demanded economy of time and consequent brevity of style, the author does not appear to have curtailed description in either branch of his subject, and though we are not told whether the 26 diagrams given in the book are *fac simile* reproductions of those used for lecture purposes, yet they are sufficiently explanatory for the reader's purpose, and go far towards rendering the book of special interest and service to all engaged in designing, constructing, and repairing pumps of the types in use for general purposes.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

### UNRELIABLE ENGINEERS.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—Harsh-sounding as the above epithet may appear, some years' observation of the subject has forced upon me the unwilling conviction that a section of our fraternity exists sufficiently numerous to justify its continued application.

That this is a lamentable admission, as well as being a grave imputation, I fully concede; but if it will open our eyes to the fact that such-vaunted, Heaven-born superiority as is only mythical, I will cheerfully brook any

odium my feeble condemnation may evoke. It strikes me that while our theoretical education as an engineering community is keeping pace with, if not in advance of, the times, we are fast losing that practical pre-eminence in workmanship which formerly found us markets for our labour throughout the civilised world. Every man is a specialist nowadays. The man who fits together a valve link motion in the workshop is quite at sea if sent to fix a propeller on its shaft or grind a cock-plug into its barrel. I have both worked with, and had under my charge from time to time, men from various parts of the United Kingdom, the Continent, and United States of America, altogether representing the practice of many workshops, and I will aver that when placed in positions of mechanical difficulty, such as is frequently experienced on board ship, the lack of resource evinced by our British artisans is in many cases distressingly apparent. How many men in charge of machinery will you meet—with an ample subordinate staff—who have not had at some period to do a job themselves from the inner consciousness that if they did not do so they would have to stand over it from its initial to its final stage, which practically amounts to the same thing. How many *soi-disant* engineers will you find who, when starting their engines, open the starting-valves simply because starting-valves are provided, sublimely unconscious on which piston or on which side of the piston they are admitting steam. How few chief engineers have not been compelled to distribute the necessary work—not in the order which their judgment dictates as being the most expeditious or essential—but influenced by a feeling of shaken confidence in the ability of some one of his juniors to carry it to a successful issue. The dressing of a chisel or the tinkering of an oil-feeder is to many of these tyros an occult branch of thermo-mechanics which should always be sent on shore to the professors of these respective arts for repair. I have seen as much red lead putty wasted over the repeated making of an ordinary four-bolt pipe-joint, as would, in the hands of a competent man, have sufficed for every joint on deck, and when this rising star of our profession ultimately completed his task he had left additional work for two men to wash up and clear away the *débris* of gauze wire, paint, and putty, besides strained and broken skeleton and screw wrenches to be repaired. It is by attention to apparently trivial details that the careful engineer asserts himself. The money value of the time sometimes unblushingly and wilfully spent over an insignificant piece of work would in many cases double the total cost of the article, and it is this want of discrimination on the part of workmen which has led to the introduction of that wretched system called piece-work. I was placed by my employers on one occasion in charge of a new steamer, rebuilt at an East Indian port. The engines were sent out from home. About five-sixths of the workmen on board were natives, the remaining one-sixth Europeans. Will it be credited that I studiously forebore, on more than one occasion, allowing the two races to compete side by side on similar jobs, previous experience having inspired me with a painful prescience that the result would be disastrous to the reputation of the British mechanic. I have no doubt many of your readers could endorse these statements and supply similar illustrations if they do not lack the moral courage to speak their minds. It is, in my humble belief, imperatively necessary that we should cast the scales from our eyes and realise the wholesome though unpalatable truth, ere our insular arrogance suffers a rude awakening at the hands of the despised foreigner. It is, indeed, a sad commentary upon our boasted progress that the foreigner should be gradually but surely ousting us from some of the most lucrative positions abroad, yet the assertion is, in the main, strictly true. The foreign consul—notably German—take an almost paternal interest in the welfare of their compatriots abroad, even to the extent of placing themselves under personal obligations to ensure their employment; and the moral of this, in its bearing upon the subject at issue, is that it behoves us to be more keenly alive to the qualifications which should give us preference. The present bright outlook cannot last for ever, and the struggle must eventually resolve itself into the survival of the fittest. I hold that the workshop service of three years at present exacted by the Board of Trade is much too short. It might with advantage be extended to five years. It seems scarcely credible that while so much store is set by the Board upon a candidate's technical knowledge, no test whatever is applied to ascertain the extent of his practical proficiency. I grant there are some difficulties in the way of attaining this desideratum, but they are not insuperable. The Board of Trade insists upon testimonials of character and

sobriety being produced by aspirants to their certificates. Why not make it a *sine qua non* that their abilities as good or fair workmen shall be certified by their employers, and, also, by the chief engineer of the steamer in which they serve. Under existing conditions all that is needful after the candidate has proved his three years' apprenticeship and one year's sea service (foreign), is an assurance of sobriety from the master of the steamer or steamers in which he has served. That is no doubt a very essential condition, but a shipmaster is not in a position to judge of an engineer's professional skill. I am of opinion that all testimonials of this description should be compulsorily endorsed by the certificate number as well as the name of the grantees, whether captain or chief engineer, who could thus be made amenable to the Common Law in the event of giving a false certificate of conduct or ability. Printed forms might be made available at the Mercantile Marine Offices for the purpose, and thus the difficulty be partially, if not wholly, surmounted. I would be glad to see the pros and cons of this momentous subject ventilated in your valuable columns. Personally, I am not actuated by any animus towards my brother engineers. Why should I? It is by publicity, and by publicity alone, our shortcomings are brought to light; and silent condonation, under the present circumstances, would be suicidal to our best interests. The knowledge that a lack of artisan skill might militate against his future advancement, would provide an incentive to many apathetic, though inherently apt, mechanics, and cause a healthy emulation, conducive alike to our National and individual prosperity.

W. L. P.

## Miscellaneous.

**NEW STEAMERS FOR THE SOUTH AFRICAN TRADE.**—The directors of the Union Steamship Co. have decided to name the two steamers now under construction for the Intercolonial and Continental branches of their South African Mail Service, the *Tyrian* and *Norseman*. These vessels are being constructed by Messrs. Day, Summers & Co., Northam, Southampton.

THE AUSTRIAN NAVY is being increased by two new cruisers. One of them will be launched at Trieste on the 18th inst. She is a vessel of 3,800 tons, has cost 1,900,000fl., without armament, and will carry two 24-centimetre guns and several small guns and torpedo-tubes.

**FLEET ENGINEER DURSTON**, who has been appointed Engineer-in-Chief of the Navy in succession to Mr. Richard Sennett, resigned, was for many years Chief Engineer of Portsmouth Dockyard, and was at the time of his promotion inspector of machinery at the Admiralty. Mr. E. A. Linnington succeeds Mr. Oram, who, as already announced, has been appointed to the place of Mr. Soper, as chief engineer in the engineering branch of the Controller's department.

**A RAPID PASSAGE.**—The Union Steamship Co.'s Royal Mail steamer *Moor*, which arrived at Southampton at 2.26 a.m. on Sunday, May 19th, has made a very rapid passage from Cape Town. She left that port at 4.47 p.m. on 1st May, and the distance run, 5,999 miles *via* Madeira, was accomplished in 17 days 9 hours 39 minutes gross time, the net steaming time being 17 days 5 hours 6 minutes, giving an average speed over the whole distance of 14.52 knots per hour. This is the fastest passage yet made between Cape Town and Southampton, exceeding the *Tartar*'s previous record by 7 hours 4 minutes. The *Moor* brings from Cape Town Sir Hercules Robinson, K.C.M.G., P.C., Governor of the Cape of Good Hope, and party.

THE STEAMER "AUGUSTA VICTORIA."—A new service of powerful mail steamers between Hamburg, Southampton, and New York, by the well-known Hamburg-American Co., was inaugurated on Saturday, May 4th, by the departure from Southampton of the company's new twin-screw steamer *Augusta Victoria*, under the command of Captain A. Albers. This vessel left Hamburg at 8 a.m. on Friday, May 3rd, and arrived at Southampton at 10 o'clock on Saturday morning, having maintained a speed of 19 knots during the run till her arrival in the Solent. She left Southampton at 7 o'clock in the evening with a large number of passengers, a crew of 250, and carrying the German mails, as well as a mail specially sent down to her by the British Post Office. The *Augusta Victoria*, which was launched last December, was built and engined by the Vulcan Shipbuilding Co., of Stettin, and is the first large fast American liner built on the Continent. Her dimensions are 478 ft. long, 56 ft. beam, and 39 ft. deep, and she will draw up to 23 ft. of water when fully

loaded. She is propelled by two sets of engines driving twin screws, capable of exerting 12,500 H.P. Accommodation is provided for 1,070 passengers. The *Augusta Victoria* arrived at Southampton on the evening of the 1st inst., from Stettin to be docked, and was next morning taken into graving dock, being the largest vessel ever so treated at Southampton. Advantage was taken on the passage to Hamburg to test the vessel's speed in Stokes Bay, when she went over the measured mile six times, and made over 20 knots with and against the tide.

THE COAST DEFENCE ASSOCIATION.—We have received a communication from a number of gentlemen interested in the question, notifying us of the fact that, at the conclusion of a meeting, at which it was decided, by a majority of one, to dissolve the Naval Volunteer Home Defence Association, the minority who opposed the dissolution met and re-formed a similar society, under the title given at the head. The object of the society is, in their own words: "That the object of the Coast Defence Association be to stimulate the volunteer spirit of defence as regards the forts and coasts of the United Kingdom; to bring about co-operation between, on the one hand, the forts and sea-side towns, and on the other hand the Government; and to discourage the whole burden and responsibility of coast defence, as far as regards attacks from privateers and stray cruisers, being thrown on a Central Government Department." All communications regarding the new society may be addressed to the care of Lieut. H. Bridger, R.N., 31, Spring Gardens, London, S.W.

THE UNIVERSAL SELF-CLEANSING FILTER.—We regret to have to state that in the notice of these excellent filters which appeared in our last issue (*vide* p. 73), two of the paragraphs were, by a printer's error, set out of place, thus destroying the proper continuity of the article. Although this misplacement was obvious on reading the article, we hasten to set it right and to offer our apologies to the Self-Cleansing Filter Co. for the unintentional error committed. Referring to the first column of page 73, the paragraphs should have run as follows: The fourth paragraph, counting from immediately under "Fig. 2," and the one immediately above it, should have changed places and followed on in that order, after the description of the arrangement shown in Fig. 3.

MESSRS. EDWARD WITTH & Co.—We have much pleasure in acknowledging the receipt of a tastefully-executed specimen of the decorative work of this firm in the form of a small easel painting of the s.s. *Chicklade*. We have all the more pleasure in accepting this most excellent example of the decorator's art from the fact of its having been presented in recognition of the success which has attended our efforts to make our launch reports as complete as possible, and we sincerely thank the firm for their kind appreciation. It may interest our readers to know that the members of the decorative department of this firm are all young ladies who are attached to the drawing office, and that it is Messrs. Witth's usual custom to make a small easel painting and present it to the lady who christens the vessel as a memento of the launch. Young ladies are also employed by the firm for office work, in order to take the clerical work out of the ship-designers' hands, so that the latter may devote the whole of their time to the constructive details of shipbuilding.

SHIPBUILDING CONTRACT.—Messrs. Fleming & Ferguson, shipbuilders and engineers, Paisley, have received an order from the Barry Docks Co., Cardiff, for one of their improved hopper dredgers of 850 tons capacity. She is to be fitted by the builders with their new type of quadruple engines, and with their patent independent traversing gear for moving bucket ladder in advance of hull, so as to enable vessel to make her own flotation.

INTERCHANGEABLE CHAIN WHEEL.—Though the patent interchangeable chain wheel introduced by Messrs. Smith & Stephens, of Sunderland, has been but a comparatively short time before the public, it has already achieved a very wide-spread popularity, and is every day coming more and more into favour. This is evidenced by the very large number of shipowning firms which have adopted it for use on their steamers. Besides being put into use on several locally-owned steamers, the wheel has been ordered largely for vessels registered at other ports, some of them being passenger steamers belonging to first-class lines. Among these may be mentioned the s.s. *Adirondack*, owned by the Atlas Steam Shipping Co., Liverpool, the s.s. *Toledo*, the s.s. *Golconda*, the s.s. *Barcelona*, the s.s. *Citta de Messina*, and the s.s. *City of Rome*. The manufacturers have now, we understand, orders for this very useful speciality from several important shipowning firms, and inquiries respecting it are daily being received.

**Recent applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, from April 15th to May 15th, 1889.**

- 15036a J. O'Kelly. Torpedoes, &c.  
 6421 A. Brown. Land Pumps and their connections in dredging vessels.  
 6448 E. A. Wood. Steering ships.  
 6451 Edwards (M. Timoni). Protecting rudders, &c.  
 6574 J. Stanton. Life buoys.  
 6577 A. Robertson. Ships' side lights.  
 6645 J. L. Thomas. Safety valves.  
 6651 G. Kosmack. Gauging the motion of a ship's keelson.  
 6664 G. Zanni. Propulsion of boats, &c.  
 6685 J. Goodwin. Self-levelling sleeping berths, tables, &c.  
 6694 Brookes (G. A. Greeven). Surface condenser for high pressure engines.  
 6697 Gedge (A. P. Brayton, Jr.). Waterwheels.  
 6707 A. Woods. Saving life at sea.  
 6716 J. H. Amour. Ship's power steering gear.  
 6743 D. Nicoll. Signals to be used by vessels afloat.  
 6746 C. T. Colebrook & J. Gangee. Rotary engines.  
 6748 F. Cordenons. Rotary engines.  
 6755 E. Gossmann. Rotary, pumping, &c., engines.  
 6773 J. Cochran & W. Cameron. Trip expansion gear.  
 6788 M. Blumrich. Motor and vapor engines.  
 6798 E. Wigzell & J. Pollit. Triple-expansion engines.  
 6792 R. H. Radford. Steam boiler furnaces.  
 6794 W. H. & J. D. Gray. Hydraulic governor for engines.  
 6843 R. Armstrong. Steam boiler furnaces.  
 6844 J. Heaton. Hauling and lowering clip.  
 6849 Okes (F. M. Roots). Rotary blower, pump, &c.  
 6888 S. J. Coole. Life-saving belts.  
 6900 F. W. Pool. Submarine and aerial vessel.  
 6907 W. Redman. Furnace bars.  
 6914 E. Martin. Signalling lamps for use on board ship.  
 6926 G. F. Fitzgerald & T. H. Poole. Obviating the heeling movement on vessels due to the wind acting on the sails.  
 6984 J. L. & H. S. White. Steam boilers.  
 6958 J. S. Martindale. Ships' ventilating cowls.  
 6967 J. W. Blake & Son. Racing sail hank.  
 6990 J. S. Galley. Furnace fire bars.  
 7026 J. Harper. Screw propellers.  
 7029 A. Denny & G. Brown. Hoisting and stowing ships' boats.  
 7034 W. Chadburn. Speed governors.  
 7042 D. H. Rivers. Indicators for windlasses.  
 7062 T. Sandiford & A. Diggle. Steam boiler injector.  
 7187 A. M. Wood. Buoyant compound.  
 7142 C. H. M. Dörnte. Steering wheels.  
 7143 G. de Laval. Steam turbines.  
 7169 G. Chapman. Propulsion of vessels.  
 7193 G. Paul. Pontoon seat raft.  
 7204 S. E. Saunders. Folding rowlock carrying frames.  
 7211 W. R. Bell & W. J. Decker. Converting reciprocating into rotary motion.  
 7239 Thompson (G. N. McKibbin). Oil distributing cartridges  
 7241 J. Wilson. Ships, barges, bulkheads, partitions, &c.  
 7243 J. Hewitt. Rectilinear engines.  
 7265 S. Robinson & H. W. Perry. Distribution of oil on sea.  
 7301 R. Marshall. Slide valves and valve gear.  
 7321 W. Ashworth & F. Watson. Reducing valves.  
 7324 J. Rigg. Discharge and loading of coal and other cargo.  
 7377 Bosshardt (J. R. Frikart). Valve gear.  
 7458 T. T. A. Hansen and F. E. Variable expansion valve gear.  
 7462 W. Ross, Jr. Raising and forcing liquids.  
 7483 F. J. Stephen & C. Carter. Countersinking ship plates.  
 7504 S. Manning. Chart tables for navigational purposes.  
 7524 C. Clough. Steam boats.  
 7529 W. Smith. Ship railway cars.  
 7534 F. Collins and A. H. Fletcher. Diving dresses or armour.  
 7539 J. T. Ellis. Condensing smoke in steam boiler furnaces.  
 7577 J. White & J. G. H. Hill. Sheet metal boats.  
 7613 S. Price & C. A. Soderberg. Boat.  
 7669 R. Thomas. Controlling speed of rotating shafts.  
 7685 J. du Boulay. Oars and sculls.  
 7714 ~~Qu~~ (W. Pilkington). Coatingships' bottoms.

**BOARD OF TRADE EXAMINATIONS.**

NOTE.—1 C, denotes First Class; 2 C, Second Class.

April 20th, 1889.			Ferguson, R. .. 1C Glasgow		
Allan, D. ....	2C	Glasgow	Graham, Jas. F.	2C	"
Austen, J. E. ..	1C	London	Harvey, David	2C	"
Bégg, R. ....	2C	Dundee	Hood, Wm. ....	2C	London
Caldwell, R. S.	2C	Glasgow	Howarth, C. A.	1C	Glasgow
Cockburn, D. ..	1C	"	Macdonald, Alex	2C	"
Crosland, D. W.	2C	London	McMurray, Jas.	2C	"
Dennis, R. H. ..	1C	Liverpool	Milner, Wm. Geo	1C	Belfast
Downie, A. ....	2C	Glasgow	Newborn, Jas. ..	1C	Cardiff
Drummond, W.	2C	"	Ross, R. ....	2C	Glasgow
Fallows, J. ....	1C	Liverpool	Short, Jas. ....	2C	N. Shields
Fife, G. ....	1C	Dundee	Smith, David ..	1C	"
Gibson, W. H.	2C	N. Shields	Spence, Wm. ....	1C	Glasgow
Hands, J. E. ....	1C	Liverpool	Ulford, J. M. ..	1C	N. Shields
Henderson, R. ..	1C	Glasgow	Wait, Walter J.	1C	Cardiff
Howell, R. G. ..	1C	London	Watt, Jas. ....	2C	Glasgow
Lee, H. G. ....	1C	"	Whinham, T. C.	2C	N. Shields
Letton, T. F. R.	1C	"	May 11th, 1889.		
Linford, G. W.	2C	"	Arnott, Jas. ....	2C	Greenock
Lyall, J. ....	1C	Liverpool	Begg, Thos. J.	1C	London
McPherson, D.	1C	Dundee	Cross, Wm. ....	2C	Hull
Mitchell, J. ....	1C	N. Shields	Dickson, David	2C	Liverpool
Mohodeen, G. ..	2C	Glasgow	Ditcham, Wm.	2C	N. Shields
Molyneux, A. ..	1C	Liverpool	Ellwood, Jno. ..	2C	Liverpool
Morris, J. ....	2C	N. Shields	Gallow, John W.	1C	London
Newton, J. H.	2C	Glasgow	Gourlay, Robt.	1C	Greenock
Pitt, Isaac ....	2C	N. Shields	Green, Saml. J.	1C	N. Shields
Russell, H. ....	1C	Glasgow	Hill, Alfred ....	2C	Hull
Shields, J. ....	2C	Liverpool	Hoe, Jas. S. ....	2C	London
Stewart, R. ....	2C	Glasgow	Hook, Harry L.	2C	N. Shields
Thomson, A. ....	2C	"	McIntyre, Col. C.	2C	Greenock
Turner, A. B. ..	2C	Greenock	Miller, Geo. Alx.	2C	Leith
Whitehead, W. J.	2C	Glasgow	Ramsay, Wm. R.	1C	"
April 27th, 1889.			Shores, Jos. W.	2C	Hull
Aitken, Thos. ..	2C	London	Smith, Wm. G.	1C	Hull
Arduis, John H.	2C	N. Shields	Speirs, Wm. ....	2C	Greenock
Batchelor, G. R.	2C	S. hamptn	Stevenson, J. P.	2C	Hull
Bruce, John ....	1C	Aberdeen	Stott, Thos. B.	2C	Liverpool
Bunnell, Thos.	2C	Liverpool	Tarrant, Arthur	2C	London
Coley, A. B. ....	1C	S. hamptn	Thatcher, Frdk.	1C	"
Daniel, John ....	1C	Liverpool	Townson, Thos.	1C	Leith
Dixon, John Geo.	2C	N. Shields	Turnbull, Wm.	2C	N. Shields
Erroch, Jas. ....	1C	Hull	Watson, Andr. B.	2C	Leith
Fraser, Wm. ....	2C	Aberdeen	Wright, Geo. ....	2C	London
Gerrard, John T.	1C	London	May 18th, 1889.		
Henn, Thos. E.	2C	Liverpool	Allan, Jas. R. ..	1C	Dundee
Huntley, Thos.	1C	London	Arrowsmith, J. E.	2C	N. Shields
Jayne, Fredk. ..	1C	Bristol	Bloxam, F. M. S.	1C	London
Johns, John ....	1C	Falmouth	Bradley, J. T. ..	1C	Dundee
Johnson, Edw. T.	2C	Sunderl'd	Cairns, Jno. ....	1C	"
Kay, John ....	2C	Leith	Carr, Jno. ....	1C	N. Shields
McDonald, J. H.	2C	London	Dixon, L. R. C.	2C	Liverpool
McGregor, Robt.	2C	"	Dysart, Wm. ....	2C	N. Shields
McNeil, Robt. C.	2C	Liverpool	Evans, David ..	2C	"
Mellor, Wm. J.	1C	"	Grierson, Wm.	2C	"
Morris, John H.	1C	"	Hall, Joshua ....	2C	"
Murphy, Thos.	2C	"	Jardine, J. F.	1C	Liverpool
Overing, John D.	2C	"	Medhurst, T. A.	1C	N. Shields
Rayner, Frank	2C	N. Shields	Menzies, T. N. H.	1C	Leith
Ryan, David ....	2C	London	Nicoll, James. ..	2C	London
Scott, Anthony	1C	N. Shields	Owen, Robt. ....	2C	Liverpool
Scott, Chas. ....	1C	Liverpool	Perrott, Wm. J.	1C	London
Stephenson, Jas.	2C	Sunderl'd	Ramsay, Jno. ....	1C	Dundee
Stromborg, C. E.	2C	London	Schultz, W. T.	2C	London
Thirkell, R. H. W.	1C	Sunderl'd	Selby, H. F. ....	2C	"
Tremelling, A.	2C	Falmouth	St. Clair, Alfred	1C	"
Warner, C. E.	2C	London	Storey, J. T. ....	2C	N. Shields
White, James ....	2C	Sunderl'd	Taylor, Robt. ....	1C	"
Williams, R. J.	2C	Liverpool	Whitton, W. M.	1C	Dundee
May 4th, 1889.			Williams, J. R.	2C	Liverpool
Boyd, Robt. ....	2C	London	Youngs, E. A. ....	2C	N. Shields
Christie, J. ....	2C	Glasgow			

## The Marine Engineer.

LONDON, JULY 1, 1889.

A REMARKABLY fast passage has been made by the s.s. *City of Paris*, which has now reduced the record below the six days between Queenstown and Sandy Hook. Great enthusiasm has been raised in America by this feat, since the American people never fail to applaud a successfully carried out undertaking, whether by foreign people or their own. Much interviewing has been done on the other side, and compliments made; and it is a curious fact that these have all been rendered to the captain of the *City of Paris* rather than to the engineering department. We do not wish in any way to detract from the credit due to a captain and his officers for their skilful navigation of a vessel from port to port, but it is obvious on the face of it that the captain and his officers would be quite helpless in the production of a fast passage were it not for the co-operation and skill of his engineering staff. The extraordinary rapidity of the passages now effected across the Atlantic are due, in the first place, to the excellent design of the vessels and engines, but chiefly, as a matter of fact, to the untiring energy and watchfulness on the part of the engineers in charge of the engines in watching that everything is going right. Every ten pounds increased pressure carried on the boilers above the average with engines running at high speed, simply means extra forcing of the draught and more laborious exertions on the part of the stokers in keeping up the supply of fuel, and in stoking and placing it upon the fires to the best advantage; and every revolution of the engines above their general average means more minute and careful watching of every journal to prevent it running hot, and the anticipation throughout the engine of any indication of approaching failure or want of strength and soundness. If the details were more carefully gone into, we have no doubt that it would result in finding a record of extra toil and exertion on the part of the stokers and double or treble hours worked by the engineers in charge in amending and adjusting parts threatened by weakness owing to the continuous strain upon them. There is evidently some considerable injustice still existing in the relative position of the engineering and seafaring staffs respectively, on board our large commercial steamers as in the Navy. It is reported that Captain Watkins has said that he will, in a short

time, reduce the record to five days and twelve hours. Now, without wishing to detract from the evident energy and force of will which the captain may be desirous of applying to all those under him for succeeding in such an effort, we cannot see that he personally can conduce any of the necessary skill or labour that will be required to effect such a purpose. It is evidently not the captain, but the engines and screws that drive the ship, and it is only the engineers that have the technical skill and knowledge to enable them to get more or less out of the engines and boilers in a certain time. We think that, in whatever praise may be conferred for that which has been effected, or in any statements with regard to what may be hoped to be effected in the future, the name of the chief engineer, Mr. Ernest Gearing, should at least be referred to as a main spring in any such efforts together with that of the captain. Our generation will probably see a considerable change in the direction we indicate in the relative estimate of the seafaring and engineering officers of a steamship.

THE generally-accepted theory that heat applied through any medium for motive purposes produces an equivalent of work proportional to the heat units absorbed independent of the medium, seems to have received a considerable shock from the experiments lately carried out by Messrs. Yarrow & Co. in engines driven by the evaporation of petroleum spirit. The successful results and extreme economy of the sample launch fitted by Messrs. Yarrow & Co. with petroleum spirit engines, is now well-known, and it is possible that the extended application of this system of evaporation to larger vessels, has at least become feasible, though naturally much time may elapse before so radical a revolution in the marine engine market shall become established. In the meantime, however, certain grave questions have been raised as a consequence of these experimental tests, with regard to a possible flaw in our hitherto accepted thermodynamical laws. As an illustration of what is now accepted as a primary basis for the production of power from heat, it is believed that where hot air is used as the medium for producing motive power or water by evaporation into steam, the theoretical work so developed would be the same for every unit of heat expended by the source of combustion. Assuming that the specific appliances by which the heat was communicated to the medium were equally economical

in such transmission; hence, although it is known that ether and other liquids will evaporate at lower temperatures, and with less absorption of heat than water, it is stated that the development of power by the resulting expansion obtained will be equivalent in any vaporized liquid media for the units of heat absorbed thereby. The results, however, from Messrs. Yarrow & Co.'s experiments, would appear to point in rather a different direction. The economy of their actual launch apparatus was very marked indeed as compared with an ordinary steam boiler and engine, but this, to a great extent, may be set down to the much more perfect heat absorption of the apparatus used for volatilizing the petroleum spirit than as compared with an ordinary steam boiler. Messrs. Yarrow & Co. have, however, gone further than this, and have carried out private experiments in their own workshops, so that the differences of boiler efficiency should be eliminated and the evaporation of petroleum be compared directly as far as regards all external conditions on the same footing with water. As a result of this test, for an equal expenditure of fuel under both circumstances as nearly identical as it was possible to make them, 11,975 foot-pounds were obtained per minute by petroleum spirit, as against only 5,199 foot-pounds per minute from water. This, then, for a heat equivalent absorbed, shows an advantage to the production of power by evaporation of petroleum spirit of double the value in work units as compared with the evaporation of water. As, however, the amount of latent heat of evaporation in the two fluids is probably not alike, and in water evaporation this latent heat can only be realised in part by the creation of a vacuum, the different proportion of latent heat required for the evaporation of spirit may have a good deal to do with this larger development of power from petroleum spirit. The experimental result is, however, we believe, an actual fact, and thus points to a possible revolution in the choice of the best medium for evaporation. We shall watch further results with great interest.

THE employment of forced draught at sea is a question far from being satisfactorily settled as yet. One reason for this is undoubtedly that the adoption of forced draught in the Navy is owing to specific requirements for forced speed, whether economical or not, whereas as far as regards the commercial marine, pounds, shillings and pence will eventually

determine the case. It would seem that successes and failures are about balanced, the adaptations of forced draught in some cases being praised by all concerned, and in other cases not being much thought of as regards economical effect, and being much disliked owing to increased tendency to break down. With regard to successes or failures respectively, it is instructing to note that actual failures in the action of the apparatus are invariably associated with high forced draught pressures, such as is due to two inches of water or thereabouts, and that those cases which, if not a startling success from an economical point of view, have at least worked satisfactorily, are due to low pressures not exceeding about half an inch of water. It would, consequently, seem to be a necessary conclusion that Trans-oceanic voyages by commercial steamers must be carried out at comparatively low-forced draught pressure to avoid the risk of constant leakage or failure of the boilers which seem to ensue almost certainly under high-draught pressures. We are not much surprised at such various results, as it will be noticed that the result of automatic and smokeless coal feed apparatus as applied to land boilers have had an equally checkered existence as regards success and non-success. The key to the matter, in our opinion, lies, both as regards sea or land boilers, in the specific conditions and construction of the boilers in any case, and on the fuel which has been in use before the introduction of the modifications. Where the boilers are of considerable power and usually burning good coal, there is little to be gained, in our opinion, by modifications as to forced draught. Where, however, the boilers are pinched for power and in dimensions, or where the coal is of an inferior quality, requiring special draught for its effective burning, then the application of a forced draught would undoubtedly produce such more perfect combustion and higher evaporation as would greatly aid to the speed of the ship and to the relief of the stokers, and would thus be accredited as a complete success. Should the forced draught enable a cheaper coal, such as slack or small coal, to be burnt efficiently in place of a higher-priced coal, and should such small coal be available at the ports to or from which such vessel is bound, here there would be a perfectly definite and important economy suiting the special occasion and circumstances, but which is no proof of a similar result

being obtained under different circumstances. There is also a want of still further definite information as to practical results of various draught pressures so as to determine the maximum pressure which may be safely used without great risk of injury to the boilers. At present, we think this is likely to be limited to pressures not exceeding half an inch to one inch of water. Should this prove to be the case, the question then is narrowed for shipowners as to whether such limited air pressure in forced draught is sufficiently economical in its working to warrant the adoption of the system and the change from the ordinary arrangements. Should any of our readers be practically engaged upon steamers employing forced draught, we should be glad to receive from them any *data* upon practical results which might be useful in forming a general opinion on the broad results of the system.

## THE CORROSION AND FOULING OF STEEL AND IRON SHIPS.\*

By Professor V. B. LEWES, F.C.S., F.I.C., Royal Naval College.

THE difficulty of obtaining adequate experimental data, and the fact that nearly everyone who has worked at the subject has had a composition of his own to bring before the public, has so hampered and restrained the free discussion and interchange of ideas on this most important question, that at the present time we have made but scant progress beyond the point reached twenty years ago, and my object in bringing this paper before you is more to excite you to discussion, and to show you the known facts of the case, than to tell you of any very new or startling discoveries.

Corrosion always precedes fouling, and it is therefore this portion of the subject that will be considered first, together with the means which have been taken to prevent it and to protect the plates of our vessels from decay.

In a paper which I had the honour to bring before you two years ago, I pointed out that in all processes of rusting carbonic acid gas and moisture played an important part, the iron uniting with the carbonic acid and oxygen of the water to form ferrous carbonate whilst the hydrogen was set free, and that the ferrous carbonate then took up oxygen dissolved in the water, or present in the atmosphere as the case may be, and was decomposed into ferric oxide (rust) and carbonic acid, which, being liberated in actual contact with the moist surface of the iron, carried on the process of "rusting."

This view of the case was confirmed by a paper read by Professor Crum Brown before the Iron and Steel Institute, at Edinburgh, last autumn, and is generally accepted as the true explanation of the corrosion taking place on iron or steel surfaces exposed to moist air or fresh water; but the rusting of the metal in sea water has by many chemists been ascribed to a more complex action, in which the salt present plays an important part by first forming oxychloride of iron.

This preliminary stage of corrosion in sea water is, I am inclined to think, a myth. When iron filings or turnings are exposed to the action of sea water, hydrogen gas is evolved, and ferrous oxide and carbonate are formed, and this changes, as in air or fresh water, into ferric oxide, by taking up dissolved oxygen present in the water. At no time have I been able to detect the presence of oxychloride, and from the fact that a few

drops of alkali added to the sea water stop the corrosion, I am of opinion that the simple rusting of iron in sea water is due to the same cause as in fresh—i.e., the decomposition of the water by the iron in presence of carbonic acid.

The saline constituents of sea water, however, do undoubtedly play an important part in a more active form of corrosion, by helping to excite galvanic action between the iron in the plates and any foreign metal or impurities present, an action which is also materially aided by want of homogeneity in the metal, by particles of rust, by mill scale, by wrought and cast iron or steel in contact with each other; or even by the different amount of work, such as hammering or bending, undergone by different parts of the same plate; and in all of these cases the galvanic action set up causes rapid oxidation of the iron at the expense of the oxygen of the water, hydrogen being evolved.

We may therefore consider that on the skin of a ship two processes of rusting are going on, the one simple corrosion on exposed surfaces of the metal, due to the presence of moisture, carbonic acid and free oxygen, which forms a fairly uniform coating of rust on the metal; and the more local corrosion, due to galvanic action, which results in pitting and uneven eating away of the plates.

As I pointed out in my previous paper, rust cones are due to the most local form of galvanic action, caused by the presence of a speck of deposited copper, lead, or other foreign metal, or even a small particle of rust, or mill scale, left on the surface of the iron, and covered by the compositions used as protectives and antifoulers; as soon as the sea water penetrates to these, galvanic action is set up, water is decomposed, rust formed, and the escaping hydrogen pushes up the composition, forming a blister, the hydrogen leaks out, and water leaks in, the action becoming more and more rapid, and the blister gradually filling with the result of the action—rust. The blister bursts, but the cone of rust has by this time set fairly hard, and continues to grow from the base, the layers of rust being perfectly visible in a well-formed cone, and when the rust cone is detached, the pitting of the metal at the base of the cone is, as a rule, found to be of considerable depth.

The speck of foreign matter which has caused this destructive action generally clings to the surface of the iron, and, being at the bottom of the pitting, escapes detection and removal, and when the vessel, newly coated with fresh compositions, again goes to sea, the corrosion will again probably be set up in the same spot.

The corrosion of the plates in the interior of a vessel is a subject quite equal in importance to the external action of sea water and dissolved gases on the metal; and from the fact that certain portions of the interior plates, from their position, escape the frequent examination and attention bestowed upon the exterior, it becomes a still greater source of danger.

Corrosion, like all other forms of chemical action, is much accelerated by increase of temperature; and in the double bottom of a ship, near the furnace-room and boilers, this has a considerable effect in increasing the rapidity of rusting. Also in the coal bunkers, the mere contact of moist coal with the iron plates sets up galvanic action, carbon being electro-negative to iron, and the coal dust which sifts down into the double bottoms lends its aid to the destruction of the plates; whilst, if the coal contains any "pyrites," which is nearly always the case, these double sulphides of iron and copper are gradually oxidised into soluble sulphates of the metals, and these, washing down into the bilge water, would at once cause most serious corrosion, should they come in contact with any bare portion of the plates. Repairs to any portion of the inside plates will loosen rust and mill scale, which, finding its way into the bottom, tends to set up galvanic action; whilst the scale of oxide of copper from copper and brass fittings and pipes is another great cause of danger, as the bilge water would gradually convert it into soluble salts, which will deposit their copper upon the iron wherever a crack or abrasion enables them to come in contact with it; and finally, leakages from stores and cargo are in many cases of a character highly injurious to iron.

In addition to all these sources of danger, we must remember that the interior of the vessel is the part most liable to abrasion from shifting and moving of cargo, coals, etc.

The protection of the outsides of the bottoms of our ships from the destructive agencies of sea water and dissolved gases may be said to have been attempted in two ways—by metallic and by non-metallic coatings.

So far, all attempts at metallic coatings have proved absolute failures, and, as far as it is possible to judge, there is but small likelihood of their ever being made to succeed, because in ord-

\* Read at the Thirtieth Session of the Institution of Naval Architects.

to protect the iron of the ship there must be galvanic action, and this action must take place evenly all over the surface of the iron plates, which means that the sheathing must be in uniform metallic contact with the iron plates, in which case the wasting of the sheathing would be so rapid that it would practically have to be renewed after every voyage, which, even leaving out the question of cost, is in most cases absolutely impossible.

Zinc is practically the only metal which could be used for this purpose, in order to place the plates of the ship in an electro-negative condition, and it is, therefore, to zinc that inventors have turned from time to time, the chief novelties introduced being the method of attachment. As far back as the year 1835, I believe, Mr. Peacock tried zinc plates on the bottom of H.M.S. *Medea*, and in 1867 Mr. T. B. Daft again brought the subject forward; Sir Nathaniel Barnaby, Mr. McIntyre, and others, also suggesting various plans of attachment, whilst as late as last year Mr. C. F. Henwood read a paper at the United Service Institute again strongly advocating zinc sheathing as attached by his system.

Where the galvanic contact has been but small, there the sheathing has had a short life, but has afforded but little protection to the iron, and has gradually decayed away in a very uneven fashion; whilst in those cases where galvanic contact has been successfully made, the ship has generally returned from her voyage minus the sheathing.

Another drawback to the use of zinc sheathing is one which was found when it was used to coat wooden ships, and that is that zinc when in sheets, like every other metal, is by no means homogeneous, and that for this reason the action of sea water upon it, leaving out of consideration galvanic action, is very unevenly carried on, the sheathing showing a strong tendency to be eaten away in patches, whilst the metal itself undergoes some physical change, and rapidly becomes brittle.

Attempts have been made to galvanise the iron before the building of the ship; but Mr. Mallet showed as early as 1843 that this coating was absolutely useless in sea water, as in from two to three months the whole of the zinc was converted into chloride and oxide, and that when, therefore, galvanising is used, as much care must be taken to protect the thin coating of zinc as would have been necessary for the iron. This does not, of course, apply to fresh water, in which galvanised iron would answer very well, the rapid action being due to the salts in the sea water; but even in this case the galvanising would have to be done after the plates had been rivetted together, as any breaking of the surface would set up rapid wasting of the zinc, and it could, therefore, only be used on small craft.

Tin and lead have been proposed for coating ships, but, like copper, these metals are electro-negative to iron, and would rapidly destroy the hull, should any abrasion of the coating take place.

The non-metallic coatings which are intended to do away with corrosion have been almost endless. At the present moment there are upwards of 80 in the market; whilst the patent list of the last 50 years contains an enormous number which were practically still-born.

They may be divided for convenience into—

- (a) Oil paints.
- (b) Pitch, asphalt, tar, or waxes.
- (c) Varnishes, consisting of resins and gums dissolved in volatile solvents.
- (d) Varnishes, containing substances to give them body.
- (e) Coatings of cement.

And, before going into these in detail, it is necessary to consider the condition of the surfaces to which they will have to be applied, and the effect this will have upon them.

Air has the power of holding water vapour in suspension, the amount so held being regulated by the temperature; the higher the temperature the more can the air hold as vapour, whilst any cooling of the air saturated at the particular temperature causes a decomposition of the surplus moisture. When a ship is scraped down to the bare iron in the dry dock, we have a huge surface of metal which varies in temperature much more rapidly than the surrounding air, and cools much more rapidly than the stone walls of the dock; as it cools so it chills the layer of air in immediate contact with it, and causes a deposition of the surplus moisture on its surface—a phenomenon known as the "sweating of iron"—and on to this moist surface the protective composition has to be painted. If now a rapidly drying varnish is put on, the rapid evaporation of the volatile solvent causes again another sudden fall of temperature—evaporation being always accompanied by loss of heat—and

this fall of temperature again causes a deposition of moisture, this time on the surface of the protective, so that the coating is sandwiched between two layers of moisture, both of them probably acting deleteriously upon the resin or gum in the varnish, whilst the moisture on the iron also prevents adherence of the varnish to the metal. If, instead of a quick-drying varnish, the old-fashioned red lead and linseed oil protector had been used, the second deposition would not have taken place, but the sweating of the iron would have prevented cohesion, and, when dry, any rubbing of the coating would bring it off in strips.

The condition of the outer skin of a ship, when she is being coated with her protective composition, is one of the prime factors in the discrepancies found in the way in which compositions act. It being a very usual thing for a composition to give most satisfactory results on several occasions, and then, apparently under exactly similar circumstances, to utterly break down, and to refuse even to keep on. Too much stress cannot be laid upon the condition of the plates at the time of coating, and it is absolutely essential either to have a perfectly dry ship, or else a composition which is not affected by water.

When an old ship is broken up, you will often see on the backs of the plates the numbers which had been painted on them with white lead and linseed oil before the ship was built, and under the paint the iron in a perfect state of preservation, the secret being that the paint was put on while the plates were hot and dry.

Boiled linseed oil, mixed with red or white lead, is amongst the oldest of the protective compositions in use, but of late years has been but little employed, since it was proved by M. Jouvin, of the French Navy, and also in this country, that compounds of lead, when exposed by the wasting of the linseed oil to the action of sea water, are converted into chloride of lead, and this is rapidly acted on by the iron, depositing metallic lead and forming chloride of iron, the deposited lead carrying on the corrosion of the iron by galvanic action. The drying of boiled linseed oil is due to the fact that it has in it a certain quantity of an organic compound of lead, and the drying properties are given to it by boiling it with litharge (oxide of lead,) so that, even when red or white lead is not mixed with it, still lead compounds are present, and this action will go on to a lesser extent. When the boiled oil dries, it does so by absorbing oxygen from the air and becomes converted into a sort of resin, the acid properties of which also have a bad effect upon iron, so that protectives containing boiled oil are open to objection. Within the last two months a good example of the action of sea water on the bottom of an iron ship, coated with red lead, has been afforded by H.M.S. *Nile*, which, after being painted over with coats of red lead, was allowed to remain for some months in Milford Haven, with the result that her bottom is very seriously corroded, and, on examination of specimens of rust taken from her, the crystals of metallic lead are in many cases easily identified.

If red lead is used, it can only form a ground work for an anti-fouling composition which has to protect the red lead as well as the iron of the ship from the action of sea water, and when the anti-fouling composition perishes then serious corrosion must ensue.

The second class of protectives, consisting of tar and tar products, such as pitch, black varnish, and also asphalt and mineral waxes, are amongst the best protectives, the waxes especially not being affected by the sweating of the plates, and forming admirable coatings for the plates. Certain precautions, however, must be taken in the case of tar and tar products, both of which are liable to contain small quantities of acid and of ammonia salts; but if care be taken to eliminate these, and if it could be managed to apply this class of protectives hot to warm plates, the question of protection would be practically solved, bituminous and asphaltic substances forming an enamel on the surface of the iron which is free from the objections to be raised against all other protectives, that is, that, being microscopically porous, they are pervious to sea water.

The third class of protectives consists of varnishes formed by dissolving gums or resins in volatile solvents, such as spirit, turpentine, naphtha, fusel oil, &c., and such varnishes are open to several objections—in the first place they are acted upon by moisture, which causes a deposition of the resins or gums as a non-coherent powder, and destroys the tenacity of the varnish. The amount of action which moisture has on such a spirit-varnish depends to a considerable extent upon the proportion of resin or gum to spirit, when the solvent is present in large

quantities, and the resin in comparatively small; then the moisture has apparently little action; but it must be remembered that the drying of such protectives means the rapid evaporation of the solvent and concentration of the resin or gum, whilst the rapid volatilization which is going on cools the hull of the ship, and causes deposition of moisture on the drying varnish with most disastrous results.

Another point which must be borne in mind is that no such varnish is impervious to gases and liquids. We are apt to think of a coating of varnish as being perfectly homogeneous; but, on examining it through a microscope, it is seen to be full of minute capillary tubes, which become gradually enlarged by the action of water, and finally result in the destruction of the varnish, whilst moisture and dissolved gases find their way to the metal and carry on corrosion. The application of several coats of varnish tends to diminish this evil, as in many cases the holes in the first coat will not correspond with the holes in the second, and so each succeeding coat will tend to make the protective more and more impervious. In using such varnishes, they must only be applied in favourable weather, and must be allowed to thoroughly harden before being brought in contact with the water.

In the fourth class we have varnishes of this kind to which body has been given by the addition of foreign constituents, generally mineral oxides; and this class is far preferable to the last, if the solvent used is not too rapid in its evaporation, and if care has been taken to select substances which do not themselves act injuriously upon iron, or upon the gums or resins which are to bind them together, and are also free from any impurities which could do so.

At present the favourite substance used to give colour and body to such varnishes is the red oxide of iron, the colour of which effectually cloaks any rusting which may be going on under it. In using the red oxide for this purpose, care should be taken that it contains no free sulphuric acid or soluble sulphates, as these are common impurities, and are extremely injurious, tending to greatly increase the rate of corrosion. The finest coloured oxides are, as a rule, the worst offenders in this respect, as they are made by heating green vitriol (sulphate of iron), and in most cases the whole of the sulphuric acid is not driven off, as the heat necessary impairs the colour; this acid is often neutralized by washing the oxide with dilute soda solution, but very little trouble, as a rule, is taken to wash it free from the resulting sulphate of soda, which is left in the oxide.

A sample of exceptionally good colour intended for using in protective compositions was sent me a few weeks ago for analysis, and proved to contain no less than 15.8 per cent. of sulphate of soda.

The best form of oxide of iron to use for this purpose is obtained by calcining a good specimen of hematite iron ore at a high temperature. When prepared in this way it contains no sulphates, but from 8 to 40 per cent. of clay; if the percentage does not, however, exceed 12 to 18 per cent., it is perfectly harmless.

Composition manufacturers can easily test their red oxide for themselves, to see if it contains soluble sulphates, by warming a little of it with pure water, filtering through blotting paper, and adding to the clear solution a few drops of pure hydrochloric acid, and a little solution of chloride of barium (easily obtained at any druggist's). If a white sediment forms in the solution, the sample should be rejected.

In a previous paper on the corrosion and protection of iron and steel ships, I pointed out that when such a varnish perished, the oxide of iron being left in contact with the iron plates, increased the corrosion going on at the surface of the metal, all oxides being electro-negative to the metals from which they are produced, and on that occasion I advocated the use of finely-divided metallic zinc, which can be obtained as an impalpable powder, in place of the oxide of iron, pointing out that such a composition would last as long as any varnish of this class, and that, when the varnish perished, as it must do after long exposure to sea water, then the metallic zinc would, on coming in contact with the iron, set up galvanic action; but that, instead of being electro-negative, as in the case of oxide of iron, and causing corrosion of the plates, it would be electro-positive, and in consequence would protect them, being itself slowly oxidised, and so would give a fresh period of protection.

I hoped at the time that I had made it perfectly clear that the zinc would in no way act until both the anti-fouling and protective varnish had perished, and had become spongy and porous, and that the idea was a prolongation of the period of

protection, the great point which has now to be aimed at; but the remarks made afterwards in several journals which were kind enough to notice my paper showed me that they had mistaken my intention, and supposed that the zinc was put in to at once create galvanic action, and predicted that if by any chance it did act, the hydrogen generated would blow the composition into blisters, and defeat its own purpose. I need hardly point out that nothing was further from my intention, as zinc in fine powder would be acted on more rapidly than the dense metal in plates, and I have already pointed out that this is destroyed too rapidly by galvanic action to render it of practical use as a protective *per se*.

As to the hydrogen blowing off the composition, no gas could be generated until both the anti-fouling and protective coatings had been perished and rendered perfectly porous by the action of the sea water, a condition which would have permitted the free escape of the generated hydrogen, which, it must be remembered, will permeate through openings which other gases cannot pass through.

One of the largest firms of composition manufacturers had enough curiosity to try the effect of zinc *versus* oxide of iron, and painted a patch of it upon a ship coated with his compositions, and after a long voyage she returned with her protectives in perfectly good order, and had it not been for the patch containing zinc having had its position fixed by careful measurements, its whereabouts could not have been discovered. This is exactly what one would have expected; as long as the varnish remains intact, oxide of iron, zinc, or, indeed, any substance which will not damage the varnish, does perfectly well; but had the vessel been allowed to continue until the varnishes had perished, then I venture to say that the patch containing the zinc would have shown better protection than those parts containing the oxide of iron. My ideas have undergone considerable modification during the past few years, but I still consider the views I put forward in my last paper were perfectly sound, and I am every day more and more convinced that the great object the composition maker has to aim at is the prolongation of the life and effectiveness of compositions, and not the multiplication of short-lived devices, however admirable in their action.

(To be concluded in our next No.)

## LAUNCH OF HER MAJESTY'S SHIP "VULCAN."

ON June 13th, the *Vulcan* was launched at Portsmouth, with the customary formalities. Though light, being destitute of armoured protection, she is the longest vessel hitherto built at the dockyard, and she has the further distinction of being the first ship of the kind expressly designed for the Navy. For though the *Hecla* performs similar duties afloat, and may on that account be regarded as a sister ship, she was purchased into the service and converted into a torpedo depot. In spite of her bulk, the total weight of the *Vulcan's* hull does not exceed 3,200 tons, of which 2,500 were actually on the blocks at the time of launching. Though capable of either fighting or avoiding an action, her special province in war will be to act as a base of operations for a torpedo boat flotilla or the torpedo boats of a fleet. She is officially described as a swift protected cruiser, equipped with all the requisite appliances for lifting and carrying a number of the largest torpedo craft of the second class, which is an absolute necessity, considering the manner in which these little craft are knocked about in stormy weather, and their inability to steam long distances. In addition to fulfilling these functions, she will be provided with a laboratory and a factory or workshop for the purpose of repairing torpedoes and torpedo boats and their machinery, and will contain all the gear necessary for submarine mining operations on a large scale, besides being a practice and training ship for all kinds of mining and torpedo work.

Among those present at the launch were Admiral Sir J. E. Commorrell, Commander-in-Chief, Admiral Gordon, Superintendent of the yard, Lord and Lady Bangor, Sir William and Lady Parker, Admiral Sir Henry Chads, General and Mrs. Chichester, Mr. Charles Ratclyffe, Mr. Justice Wills, Admiral D'Arcy Irvine, and a number of naval and military officers in uniform. The usual religious service having been read by the Rev. C. J. Corfe, dockyard chaplain, and the water on the slides having risen to the height of 12 ft., the work of knocking

out the remaining blocks was proceeded with. As the ship was comparatively light, there was no weight to pull her down the ways, and she remained stiff and immovable up to the last moment. Shortly before 11, Mrs. Gordon (wife of the Admiral Superintendent) gave the name to the vessel, and immediately afterwards, having, under instructions from the chief constructor (Mr. Deadman), cut the lanyards supporting the dog-shores, the immense structure glided into the water in the midst of great cheering and the strains of "Rule Britannia" from the band of the Royal Marine Artillery.

The *Vulcan* measures 350 ft. between perpendiculars and 58 ft. in extreme breadth. Her load draught of water will be 23 ft. forward and 24 ft. aft, giving her a displacement when fully equipped for sea of about 6,620 tons. The stem and stern posts are formed of large castings of steel, and she is provided with an underwater ram of a very formidable character. The double bottom extends for about half the length of the hull, and is well subdivided into watertight compartments. Practically, however, the double bottom is continued to the extremities by the watertightness of the flats to the compartments in the hold. A strongly-plated deck is worked throughout the ship below the water line. Ample protection is provided by this deck to all the vital parts of the ship, such as machinery spaces, magazine and shell rooms, and the steering compartment. Additional protection against falling splinters and injury to the machinery is afforded by a light *débris* deck in the boiler-rooms. The upper part of the structure is strengthened by a large amount of plating, including special tie plates on the upper deck, while the whale-back contour of the fore and after parts of the deck outside the breakwaters will assist in freeing the vessel of any seas that may be shipped. The amount of coal to be carried is 1,000 tons, which is stowed in bunkers both in the hold and on the protective deck throughout the spaces occupied by the machinery. The total amount of fuel carried will, it is estimated, give the *Vulcan* a radius of action of 12,000 knots at a 10-knot speed. The ship will be fitted with a large balance rudder, which can be actuated both by hand from the upper deck and by steam from the bridge, wheelhouse, conning tower, and tiller compartment. The steam power provided will be sufficient to put the helm through 70 deg. in 30 seconds while the ship is driving at full speed. Though the ventilation will be generally effected by natural means, forced draught from steam fans is provided for the main engine and hydraulic pumping engine-rooms, and to all the compartments below the protective deck abaft the engines.

In addition to the usual complement of ship's boats, the *Vulcan* will carry no fewer than nine second-class torpedo boats. Provision is made for hoisting the torpedo craft in and out of the ship by hydraulic cranes weighing each, including gear and engines, 50 tons. Each of the cranes is so arranged that it can command seven of the nine boats, and lift them out in any desired order, while the details of the fittings will enable the remainder to be run across the deck on trollies, thereby bringing all the boats within the reach of either crane. The ordinary ship's boats will be controlled by means of a hydraulic derrick attached to the main mast. The pumping, flooding, and drainage arrangements, both by hand and steam, are very complete. The *Vulcan* will be lighted throughout by electricity, and will, in addition, carry four powerful electric search lights. For this purpose three complete sets of combined engines and dynamos will be employed, the latter being of the direct current pattern, and of 400 amperes each at 80 volts. The system of voice-pipes will be in general accordance with the report of the committee appointed to consider the whole question.

Besides containing a torpedo factory and laboratory, the ship will carry a large quantity of electric cables, submarine mines and stores, and other special gear for the supply of the squadron to which she may be attached. The armament will consist exclusively of quick-firing and machine guns of the most recent construction. It will consist of eight of the powerful 4.7 in. guns, mounted upon the Vasseur central pivot principle, four forward and as many aft upon the upper deck, with plating protection for the crews in charge. Both the bow and stern guns will be capable of firing across the keel. In addition to these there will be 12 3-pounder rapid-firing guns on the main deck, and a complement of machine guns upon the upper deck between the quick-firers already mentioned. The Whitehead equipment will consist of a fixed torpedo tube at both the bow and stern above the water, two fixed submerged tubes forward, and possibly two broadside training tubes above

the water aft. The positions of these tubes will be specially protected, and so arranged that the torpedoes may be discharged by electricity either from the conning tower forward or (so far as the after tubes are concerned) from a director tower on the after part of the lower deck. The number of torpedoes carried will be 30. The propelling machinery, which will be furnished by Messrs. Humphrys, Tennant & Co., of Deptford, will comprise two independent sets of engines of the three-cylinder triple-expansion vertical type, guaranteed to develop a mean of 12,000 horses with forced draught for four hours and a mean of 7,200 with natural draught for 12 hours. Steam will be supplied by four double-ended cylindrical boilers and one single-ended auxiliary boiler, constructed of Siemens-Martin steel, the furnaces being of corrugated steel. The large boilers will weigh about 46 tons each. The working steam pressure is 150 lbs. per square inch, and the forced draught system will be used with an air-pressure in the stokeholds not exceeding that of two inches of water. Under the former condition the *Vulcan* is expected to realize a speed of 20 knots, and under the latter a speed of 18 knots. The various features enumerated will show that the ship bids fair to prove an invaluable auxiliary to a fleet. Her speed being at least as great as that of any large vessel yet afloat, and hardly less than that attained by the quickest torpedo craft, she will be able either to accept or to decline an action, while the power and rapid fire of her armament will justify her in engaging any enemy short of a battleship. Her total estimate of cost is £283,955, exclusive of guns, which are expected to cost £8,152 extra. Up to the time of his appointment as Assistant-Constructor at Hongkong, the building of the *Vulcan* was intrusted to Mr. Gourings, under the superintendence of Mr. Fitze and Mr. Deadman, Constructor and Chief Constructor respectively, but recently the work and the final launching arrangements were in charge of Mr. Ford, foreman of the yard.

### MILLS' INSTANTANEOUS ENGAGING AND DISENGAGING HOOKS.

**R**APID means of detaching ships' boats, after being waterborne, have always been regarded as a most important requirement in connection with sea voyages and cable repairing purposes. Several apparatus have been brought out for these objects of more or less merit, but none approach the above-mentioned hooks, patented by Mr. Mills, for celerity in engaging and disengaging boats and launches lowered from ships. These hooks are the only gear without safety pins to be withdrawn. There is no projection in connection with them above the thwart.

This apparatus, which we fully described and illustrated in August, 1886, has been approved of by the Board of Trade for passenger and emigrant vessels, and is now extensively adopted in the Spanish, Swedish, and Chinese Royal Navies, Mercantile Marine, telegraph repairing ships and yachts, amongst others being those of H.M. the King of Sweden, Mr. Vanderbilt, etc.

Before mentioning the excellent awards which have been made at exhibitions in favour of Mr. Mills' apparatus, and some of the Governments, companies, and firms, etc., which have been supplied with the gear, we will notify a few of the more essential particulars relating to some of the tests under varying conditions that his new mechanism has undergone.

Captain Ingleman, of the Royal Swedish Navy, states in a recent report, dated March 27th, 1889, that having since the 1st of November, 1888, up to the before-mentioned date, experimented with Mr. Mills' Hooks, fitted to one of his boats, "and carried out trials under all possible circumstances, as, lying quite still, under way, and with different speeds, up to nine knots smooth water; and also with sea and ship rolling, I declare that I am fully convinced that this gear is the best existing, and that no other can be compared with it." Captain Mackenzie, of the Blue Anchor Australasian Line, at a later date, well says that he has from his own experience and from the reports of the commanders of this line of steamers, much pleasure in testifying to the efficiency and simplicity of Mr. Mills' Instantaneous Engaging and Disengaging Hooks, which were the best he knew. After their being used in the s.s. *Hubbuck*, in 1885, they have been specified for all the other ships in the service, and are being fitted to two new steamers now building for this line.

One of the best proofs of the efficiency of this gear, is its general use by the telegraph repairing ships which have more boat work than any other service. So much has this gear been appreciated in these ships that many testimonies have been given respecting its efficiency of a very commendatory kind. The commander of the Telegraph s.s. *International*, belonging to the India Rubber, Gutta Percha and Telegraph Works Co., Limited, states that on the trial of Mr. Mills' gear fitted to their second cutter, it was put to the severest possible tests for any gear, "all of which it stood most satisfactorily. Though it is a non-automatic disengaging gear, any man (soldier or sailor) who has never seen it before cannot fail even if he be blindfolded, to disengage upon the boat being water-borne, whilst for engaging it is so simple and sure, that it will recommend itself even with those who only believe in the common hook. . . . I have taken great interest in gears of this kind for many years, and consider it superior to any I have seen. It is simplicity itself, and once fitted requires no further attention, there being nothing to foul or get out of order." He adds at a later date that, "Having now had the gear practically tested at cable work, and in the Suez Canal I am happy to confirm my previous testimonial, as it has in every way given entire satisfaction, and in towing the boat by the forward fall we found it quite unnecessary to use the painter, as it answered admirably." Commander Perkins, of the s.s. *Mirror*, of the Eastern Telegraph Co., states that the gear "works splendidly," and that he had never found it to fail "or cause any trouble under any circumstances. . . . I consider it the most simple and efficient gear I have ever used." The chief officer of the same ship has also made a statement to the same effect, and further says that, after several years' experience of dropping boats at sea under all circumstances, he found Mr. Mills' patent gear the best of any he has tried, and would advocate its use wherever he went.

W. R. Lurgan, late commander of the Chinese telegraph s.s. *Fee Chew*, has spoken in equal terms of satisfaction of this apparatus. He states that Mr. Mills' hooks fitted to this ship have given "entire satisfaction." During his career at sea, he adds, and particularly in the telegraph service, he had used many kinds of boat-lowering gear by night and day, and frequently in very rough weather with trained and untrained men, and that no gear had given him less anxiety than that of Mr. Mills, "even with a strange crew at night time, the working is so simple. It is impossible for a man to hook on any other way but the right one, and once hooked I have never known a disengagement through the boat being lifted by the sea, which has occurred to me on some other occasions with other gears." Commander Dorssen, of the s.s. *Baaren*, of the Netherlands India Steam Navigation Co., and others have also testified to the superior efficiency of the apparatus. It has been carefully examined by captains of our leading transatlantic liners, while the best satisfaction has been expressed by all respecting the excellent merits of the gear.

According to a paper read by Captain J. L. Lagerwall, R.N., of the Swedish Royal Navy, before the Nautical Society, at Gothenburg, he stated that one of the most essential matters for the commander of a ship is to have his boats in order, namely, well placed, easily accessible, and easily and safely lowered and manned. It is likewise of the first importance to him to see that the boats can be lowered and the gear detached with facility and safety.

Many inventions, he observes, have been made and patented for this purpose, some of them without doubt very ingenious and well considered, but, just as theory without practical application in daily life is useless, so an ingenious and patented apparatus that easily answers its purpose when tried with a model in a tank of water, is often entirely useless at sea during critical moments. The qualities mainly required in a boat-lowering gear are simplicity, manageability, reliability, safety. Captain Lagerwall then says that, according to his conception, "Mill's Engaging and Disengaging Hooks" fulfil these requirements as much as possible, and they ought to be extensively used in the Navy as well as in the Mercantile Marine. In both marines trials have been made with these hooks, which have turned out a success, and completely answered all expectations.

At the International Shipping Exhibition at Liverpool in 1886, Mr. Mills obtained the highest award and gold medal for his gear, though fourteen boat-lowering gears competed for the prize. He also received a gold medal, the only award granted by the Mercantile Marine Service Association, in the same year for his apparatus, the jury consisting of about 20 mercantile

marine captains; eleven rival inventions also competed for this medal. Mr. Mills was further given the highest award (a silver medal) at the Newcastle International Exhibition in 1887 for his celebrated hooks.

Numerous press notices, commendatory of his invention, have appeared, which state that it is the most useful that exists, and that, had it been used in connection with recent unfortunate steamers, a great loss of life would have been avoided.

Among the governments, companies, and firms who have been supplied with Mr. Mills' gear are the Royal Navies of Spain, Sweden, and China; the Eastern Telegraph Co.; the Silverton Telegraph Co.; the Imperial Chinese Telegraph Co.; Sir W. Armstrong, Mitchell & Co.; Netherlands Indian Steam Navigation Co.; Austrian-Hungarian Lloyd's Steam Navigation Co.; China Shippers' Steam Navigation Co.; Empresa Nacional; West Coast of Africa Steamship Co.; Isle of Man Co.; Manchester, Sheffield and Lincolnshire Railway Co.; Earle's Shipbuilding Co., Hull; Messrs. Harloff Bros., Bergen, Jennison, Taylor & Co., Sunderland; Turner, Brightman & Co., London; Gellison & Chedwick, Liverpool; W. Gray & Co., West Hartlepool; P. Laing & Co., Sunderland; Dent & Co., Newcastle; Marychurch Bros., Cardiff; H.M. the King of Sweden, and Mr. Vanderbilt's yachts, etc.

An exhibit of Mr. Mills' gear took place at Mills' Patent Boat Lowering Offices, Temple Chambers, Victoria Embankment, London, on the afternoon of the 12th June last, in the presence of a great number of Naval and Mercantile Marine officials, scientists, journalists and others, all of whom were well satisfied with the excellent simplicity, economy and efficiency of the apparatus. Of such vital importance is the gear in the event of a ship quickly foundering, that no passenger vessel should be without it. For lowering torpedo boats, the value of the gearing cannot be over estimated.

## THE PARIS EXHIBITION, 1889.

### NAVAL ARCHITECTURE AND MARINE ENGINEERING.—I.

IN our preliminary article in our last number, we indicated to some extent the character of the exhibits illustrative of Naval Architecture that were to be found in the department allotted to "The Retrospective Exhibition of Work."

These exhibits are to be found in the building running parallel with the Avenue de Suffren, and, although not very numerous, are of considerable interest. A number of models of vessels have been recently added to the British portion of this minor exhibition, which increase the value of the collection, but, unfortunately, some of them are badly placed, and, being unlabelled, will escape the attention of the vast majority of visitors. This is especially true of the model of the leviathan vessel of modern times, the *Great Eastern*, whose registered dimensions—length, 679 ft. 6 in.; breadth, 82 ft. 8 in.; depth, 31 ft. 6 in., especially as to breadth—will probably never be repeated. What enormous tonnage dues must have been levied from this vessel, the net register being 13,344 tons, and the gross register 18,915 tons.

Unfortunately the model exhibited does not show that the vessel was a paddle as well as a screw-steamer, and, altogether it is not a worthy representation of this, the greatest triumph in, at any rate, ship construction, however disastrous otherwise the venture proved to be.

Another vessel, which was a leviathan in her day, is also now represented by a model, viz., the *Great Britain*. It shows the vessel as at first constructed, a screw steamer, but with an exceptionally heavy rig. It may be remembered that about six or seven years ago this vessel was "converted" into a sailing vessel, pure and simple, for which her dimensions were well fitted, her proportion of beam to length being under six tir es.

At the time of her conversion, in order to obtain a class at Lloyd's, the hull was doubled on the sides and topsides with wood, not a commendable arrangement, except possibly on the score of economy, as thereby a number of plates that were somewhat deteriorated would have been condemned, or several strakes of plating been required to be doubled. The model exhibited gives the visitor a better idea of this vessel than in the case of the *Great Eastern*, and is more readily seen; and it

leaving her it may be remarked that her fine fore end and full after lines are the reverse of subsequent practice in Naval Architectural design.

The model of the *Charlotte Dundas* is another of the latest additions to the Retrospective Exhibition of Work, and for its special thanks are owing to B. Martell, Esq., Chief Surveyor to Lloyd's Register of British and Foreign Shipping, as we have no recollection of having seen this model at the Liverpool Exhibition, which was so replete with interest to naval architects. The *Charlotte Dundas* was undoubtedly the pioneer of steam navigation—the engines being constructed by Symington, for Lord Dundas, in 1801, and the hull by A. Hart, of Grangemouth. Mr. Martell obtained the loan of the model exhibited from W. H. Rankine, Esq., New Brompton, Kent, and it is well worthy of a place amongst its greater (in point of bulk) successors. The visitors can readily see the design of the craft, the miniature representation of it showing the stern wheel by which it was propelled—as well as the engine which actuated the wheel, fitted on the deck, on the port side of the centre line, the boiler being below deck on the starboard side. In close juxtaposition to the model of the *Charlotte Dundas* is one representing a crude arrangement of floats attached to an endless chain, probably the idea of some inventor prior to the construction of ordinary paddle-wheel steamers; but there is nothing connected with this exhibit to indicate when or by whom it was designed. Another model recently forwarded by the English Committee of the Retrospective Exhibition is that of the paddle-steamer *Quebec*, built for the passenger service on the river St. Lawrence, by Messrs. Barclay, Curle & Co., Whiteinch, Glasgow, and representative of a large number of similar vessels. Amongst the retrospective exhibits is a full-rigged model of the four-masted ships *Perséverance* and *Tarapaca*, built in 1886 for Messrs. Ant. Dom. Bordes et Fils, Bordeaux, by Mr. W. B. Thompson, of Dundee and Glasgow. These vessels have 600 tons capacity of water ballast tanks, and carry a deadweight cargo of 4,000 tons. Soon, however, they will be eclipsed by a five-masted full-rigged ship now building on the River Clyde for the same owners. The model of the *Pereire*, one of the large fleet of the Compagnie Générale Transatlantique is also another example of a French vessel. Somewhat there are but few contributions of modern naval architecture in this departmental exhibition from French shipbuilders. British firms have been almost the sole contributors, but a number of the models sent from the United Kingdom yet to be noticed are of peculiar interest for the inhabitants of *la belle France*, more especially to those who have crossed the silver streak which divides the cliffs of Albion from the Gallic shore. We refer to various models representative of past and present vessels engaged in the passenger traffic on the Straits of Dover, or, as our neighbours call it, *le Pas de Calais*. First, chronologically, we notice the paddle-steamer *Prince Frederick William*, credited with a speed of 14½ knots. This vessel was built in 1857 for the London Chatham and Dover Railway Co., by the Thames Ironworks and Shipbuilding Co., Limited, Blackwall, and is 165 ft. in length; 20 ft. beam; 11 ft. 8 in. depth of hold. The paddle-steamer *Bessemer*, built in 1874 from the designs of E. J. Reed, Esq., M.P., late Chief Constructor to H.M. Navy, comes next. This vessel, many of our readers will remember, was designed to entirely obviate sea sickness, by means of a swinging saloon, but was in no way a success. Owing to miscalculation or otherwise, the designed draught of water was greatly exceeded, and possibly it was found unadvisable to make extensive alterations to counterbalance this error, owing to the great relative size of the vessel unfitting her for the accommodation at that time provided by the harbours of Dover and Calais. The powerful dimensions of the *Bessemer* were:—Length, 350 ft.; breadth, 40 ft.; depth, 17 ft. 4 in. Each end of the vessel was alike, and both forward and aft a rudder was fitted. The engines were powerful, indicating 2,300 H.P., but only a knot greater speed is claimed for the *Bessemer* than for the *Prince Frederick William*, built 17 years earlier. The twin-paddle steamer *Calais-Douvre*, which has seen more service than the swinging saloon vessel just referred to, is also represented by a well-finished model. This vessel was the development of the *Castalia*, and while proving more successful than her progenitor, has not lead to a fleet of vessels being built after her design. The characteristics of the *Calais-Douvre* consist principally in there being two distinct hulls below water, each having rudders forward and aft, and although the vessel has large stability, due to the great beam, 63 ft., it is well known that she has not fully realised the most sanguine expectations. The Channel service is a trying one, both at sea

and in approaching land, and a craft of great bulk has many drawbacks, and although the *Calais-Douvre* has 50 ft. less length than the *Bessemer*, the beam is 23 ft. greater. It is possible that her services may be dispensed with in the future, and as she has rarely plied in the winter, this craft cannot, in her history of twelve years, have been financially advantageous. The building of the vessel, both as to design, construction, and finish, it is, however, well-known, reflects every credit to the shipbuilders, Messrs. A. Leslie & Co., since merged into Messrs. R. & W. Hawthorn, Leslie & Co., Limited. The paddle-steamer *Empress*, built and engined by the Fairfield Shipbuilding and Engineering Co., Limited, is a vessel of the latest type, whose length is the mean of that of the *Calais-Douvre* and *Bessemer*, viz., 325 ft. The breadth is only 85 ft., and total depth, 22 ft. The model of this vessel shows her to be a first-class design suited to the high speed that is claimed for the vessel, viz., 21½ knots, to obtain which 6,000 I.H.P. has to be exerted or, practically ten times as much as is requisite to drive the *Prince Frederick William* at 14½ knots.

Another vessel, whose model has been forwarded subsequently to those mentioned in our preliminary article, is that of H.M.S. *Hearty*, a twin-screw steamer of high speed, arranged for towing, &c., and provided with four guns, two at the stern and two at the fore end of the bridge. This vessel was designed, built, and engined in 1885 by Mr. W. B. Thompson, of Dundee and Glasgow, and is of the following dimensions:—Length, 212 ft.; breadth, 30 ft. 2 in.; depth of hold, 15 ft. 8 in. The design and general arrangements are first-class, and a speed of 15 knots with 2,000 I.H.P. on a displacement of 1,650 tons, must be pronounced satisfactory in a vessel of such limited length.

The Committee of Lloyd's Register of British and Foreign Shipping have contributed two models of a special character to the Retrospective Exhibition. One of these is a built half-model showing Bilbe's diagonal framing system for wood vessels, and the other a similar one showing the diagonal sheathing as per their rules of the year 1864 for wood vessels.

Marine engineering *pur et simple* is but sparsely illustrated in this historic collection. With the exception of the engine shown on the model of the pioneer vessel *Charlotte Dundas*, there is only another specimen of marine engines. It is a well-finished model of about one-fiftieth the actual size of a two-cylinder high-pressure engine of 120 N.H.P., constructed in 1865 by La Société des Forges et Chantier de la Méditerranée for a steam vessel owned by La Compagnie des Transport Maritimes. The engine is completely shown, as well as the thrust-shaft, and at the end of the latter the screw propeller is fitted. The condenser is situated right between the cylinders, and in other respects it is evident the design is continental. The propeller has very square bladed propellers, but otherwise there is nothing special to note.

There are, besides the exhibits already enumerated in this article and in that in our previous number, a large number illustrative of ancient and foreign naval architecture, which have principally been obtained from the collections in the Louvre. These are at least noteworthy as contrasts to modern and European designs. A brief survey of them must, however, suffice. Possibly the most interesting is the model of an ancient Trireme, constructed by order of Napoleon III. in the years 1860-1. This craft is a galley, dependant entirely upon oar propulsion, and, as its name indicates, has three rows of oars. It was in such craft that the armies of the ancient Roman Empire were transported when engaged on expeditions to distant lands, and the model in question was made in accordance with the dimensions and particulars found in ancient records, in order to see if it were possible for as many rowers to be accommodated as historians vouch for. This had for a long period been a matter of dispute amongst *savants*, but was finally set at rest by the construction of this model, which shows the disposition of all the oars and rowers. It may be incidentally mentioned that sometimes these rowing-galleys had four and five sets of oars, and hundreds of rowers. What mighty strides have been made in labour-saving since the days of the Cæsars!

Many other craft which have become, or are fast becoming, extinct are also represented. One of the most primitive is a Philippine fishing craft, with a thatched hut, having a large net at the stern, raised by means of a derrick balanced with heavy stones, suspended at the extreme end of a lever. All the specimens of naval architecture of uncivilised nationalities are not, however, so crude.

The war canoe or pirogue, of the Maories of New Zealand,

although hampered with heavy fendering forward and aft, possibly to obviate damage on beaching, are otherwise designed for speed, and are elaborately carved. These pirogues are credited with speeds only surpassed by the latest achievements in steamship navigation. According to Admiral Anson, the pirogues of the Archipelago of Carolina attained a speed of 20 knots. These craft are provided with one large sail, supported by a mast placed at an angle of nearly 45 degrees, besides a number of oars. Other authorities do not confirm the opinion of Admiral Anson, but still they allow that a speed of nine knots is obtained. Slight as these craft are and unprovided with nautical instruments, they have been known to traverse 300 leagues without sighting land. The war pirogues of the natives of New Zealand are shown to have had a primitive sail, formed of many pieces of various coloured material, and four oars of large dimensions.

Another craft, described as a pirogue, of Point de Galle, is a species of twin vessel, having a larger and smaller hull parallel to each other. Two masts along with three spars, secured to the principal hull, support a large fore-and-aft sail. Oars are also used in these craft, which are about 37 ft. in length. It is stated that these vessels attain a speed of 10 knots per hour.

Close to the last-mentioned, is a model of a coracle, a small rowing boat, made of wicker-work, such as were used by the ancient inhabitants of our island and neighbouring countries, and beyond all the ancient and foreign exhibits appertaining to naval architecture, the sight of it emphasises the mighty advances that have been made since those days of yore. Almost to the same extent is this true of the chelunges of the Coromandel coast with their flat bottoms, twelve oars for rowing and one for steering. Although the model of these craft show that they have considerable depth, they are "open" boats, save a very short length of deck aft, to accommodate the steersman. From the construction of the model (made in 1837, from accurate particulars then obtained) and from the particulars given in the French language only, which accompanies each of the exhibits from the Louvre, we learn these vessels have no framing—beams, or seats for the rowers, are, however, fitted.

Another model of a native vessel reminds one of the old English vessels with their numerous forecabin and poop decks, rising like stairs at each end. It represents a Philippine vessel, existing at all events in 1830—which has no decks forward or amidships, but three raised quarter-decks aft, of varying length. The model has fine lines and good rise of floor, and is typical of Philippine vessels of 34 to 40 ft. length, which have one sail suspended by a gaff or spar at the centre of the length of the head of the sail, the mast to which the gaff is attached, raking forward instead of aft, as in ordinary practice.

Another model noticed in our rapid survey of these retrospective exhibits is that of an Arabian vessel, existing in 1838. It is of peculiar interest, as it represents a type of vessel which has remained in use, despite the advances of ship design, since the days of Alexander the Great. Provided with only one sail attached to two spars, both placed at nearly right angles to the mast, it otherwise depended for its propulsion upon the rowers and their oars. Yet it was in such small and badly-rigged vessels that he who wept because there were no more worlds to conquer, embarked with his large armies, on his distant expeditions.

It is not only in Arabia that sea navigation remained for centuries in a primitive stage. A model, made of an East Indian native sailing craft, in 1830, with a mast at the bow instead of a bowsprit, and with a jigger mast aft at the port side of the tiller, and with the sails cut away at the foot to a large radius, and continued by a curve to the gaff ends, is certainly a strange specimen. To a large extent these rude ideas of shipbuilding, rigging, etc., in India, are due to the prevalence of the notion that men of good castes should not take part in navigating vessels, so that only members of the most abject castes have been available as sailors, prominent amongst which it is well known are the Lascars.

Another example of the primeval stage, in which the equipment of native Eastern vessels remain, is the model of an anchor of a Malay vessel. The flukes and shank are both formed of timber, and are united together at the crown of the anchor by strong rope or other lashing. In one respect they are modern, being "stockless," and the ring of the anchor is formed out of woven cane. These anchors had, in 1838, proved sufficient for vessels of 600 tons, even when subject to the violence of typhoons.

(To be continued.)

## THE NEW CRUISER "MAGICIENNE."

ON June 8th the steamer *Magicienne* made another attempt to pass her four hours' trial under forced draught at Portsmouth. After the expiration of the third hour the boilers primed to such an extent that it was deemed useless to continue the run. Though the engines worked admirably, the mean results of the three hours failed to quite come up to the contract power of 9,000 horses. The average revolutions were 138, and the power developed by the starboard engine was 4,339, and by the port engine 4,441, making a collective I.H.P. of 8,780. During the trial four runs were made on the measured mile, which gave a mean speed of 18.85 knots. The pitch of the propellers is greater by 6 in. than in the case of the sister-ships, and the result shows that with the guaranteed power there would be no difficulty in realising 19 knots, the designed speed. So far as the trials of the "M" class of cruisers have proceeded, they have shown the necessity of providing them with greater boiler power.

On June 15th she went out of Portsmouth Harbour for another trial of her machinery under forced draught at the back of the Isle of Wight, which was successfully accomplished without a hitch occurring. Since the last trial the pitch of the screw has been reduced from 17ft. 9 in. to 17 ft., with improved results both as to power and speed. The trim of the ship was 16 ft. 3 in. forward, and 18 ft. 9 in. aft, and at the end of the four hours' run the following data were worked out:—Pressure of steam, 148 lb.; vacuum, 23.28 in. starboard and 24 in. port; revolutions, 144 and 143.2; I.H.P., 4,516 starboard and 4,746 port, giving a collective power of 9,262, or 262 horses in excess of the contract. The maximum power recorded at any time was 9,607, and had it not been for a falling-off in the steam during one half-hour, owing to a leaking safety valve, the mean results would have been even more satisfactory. The mean speed attained during four runs on the measured mile were 19.126 knots, and as the patent log showed that a distance of 76.6 knots had been travelled while the ship was underway, it would appear that the speed was maintained throughout the trial. This, however, is not enough, for, while the engine-power is beyond that guaranteed by the contractors, the speed does not come up to the estimated speed, which is 19½ knots. In this class of vessels the difficulty which has attended the realisation of the contract power was primarily owing to deficient grate-bar surface, which, in the case of the *Magicienne*, and in that of the whole of the *Medea* type, has been increased by lengthening the fire bars, thereby proportionately increasing the consumption of fuel. The sheathed ships of the class have also been greatly handicapped by the use of horizontal engines. The Admiralty was represented by Messrs. Butler and Goodwin, and the contractors, Messrs. Hawthorn, Leslie & Co., by Messrs. Marshall and Milton. Both the *Marathon* and *Magicienne* have received their armaments, and will be at once coaled for the naval manoeuvres.

## H.M.S. "MARATHON."

PROFITING by the repeated failures of the *Magicienne* to develop her contract power of 9,000 horses under forced draught, the contractors were enabled to put the sister ship *Marathon* through a fairly successful trial of her engines at Portsmouth. Though resembling the *Medea* and *Medusa*, these vessels differ from them in being fitted with horizontal engines for the purpose of their being covered by the protective deck, and are the first of the class so fitted that have been tested under way. Both cruisers were constructed by the Fairfield Shipbuilding Co., and engined by Messrs. Hawthorn, Leslie & Co., of Newcastle-on-Tyne. The engines are of the triple-expansion type, the cylinders being of the respective diameters of 34½ in., 51 in., and 76½ in., with a stroke of 36 in. The total condensing surface is 11,850 square feet, the air-pumps being driven direct from the pistons of the main engine. Separate feed engines, both principal and auxiliary, are provided for supplying the boilers. There are also separate bilge, fire, and fan engines, feed heaters, distillers of the latest double type, an independent surface condenser, with its air and circulating pumps adapted for condensing all the steam from the auxiliary engines through the ship, including the steering engines, dynamos air

pressors, capstans, windlass, &c. Steam is supplied by double-ended cylindrical boilers, containing a total heating surface of 14,700 square feet, and a grate surface of 456 square feet, and constructed to work at a pressure of 155 lbs. per square inch. They are fitted with 24 corrugated furnaces. The four stokeholds are arranged for working under forced draught on the closed stokehold system, which has now become universally adopted in the Navy. The air is supplied to the furnaces by eight doubled-sided fans, driven direct by high-speed engines. The machinery throughout is of the lightest possible scantlings consistent with the necessary strength to withstand the strains to which it is subjected when working under forced draught and at full speed. The shafting is manufactured entirely of steel, and is hollow, the rods are made of the best mild steel, while the bed-plates, pistons, piston valves, cylinder covers, and most of the valve gear are cast steel. The stern tubes and propellers are formed of gun metal. The engines are designed to run at 150 revolutions. The ship has been furnished throughout with the latest improvements. Voice tubes and electric bells connect the conning-tower and bridges with the captain's and chief engineer's berths, engine rooms, and stokeholds. The ship is also fitted with electric steering gear, electric counters, and electric revolution indicators; while the electric light, which includes three powerful search lights, is supplied from two duplicate engines, one being stationed in the engine-room and the other in the dynamo room.

The trial was conducted by Mr. Brown, on the part of the contractors, and was watched by Messrs. Butler and Goodwin, for the Admiralty, and by Mr. Mayston, of the Steam Department of the Dockyard. The ship was weighted down to a mean draught of 17'6 in. It was not intended when the *Marathon* left the harbour at 8 o'clock to subject her to an official trial, but the preliminary trials under natural and forced draught having given such excellent results (consequent upon further enlarging the steam openings between the cylinders, and increasing the exhaust), that, although the stokers had been employed for seven hours, it was determined to proceed with the four hours' regulation trial with closed stokeholds. At the beginning the trial did not promise to be successful, but as it advanced the half-hourly observations greatly improved; and had the men not been too exhausted to allow of the run being prolonged, by deleting the first two hours the mean result would have unquestionably exceeded the guaranteed power. The trial ended at 7 o'clock, when the following means were worked out:—Steam in boilers, 146 lbs., vacuum, 22'75 in. and 24'43 in.; revolutions, 142'76 and 145'3; I.H.P., 4,423 starboard and 4,357 port, giving a collective power of 8,781 horses, or 119 below the contract. But, as the last two half hours showed a development of 9,031 and 9,173 horses respectively, with no reason to doubt that but for the limitation of human endurance the engines would have continued to produce equally satisfactory data, the trial was deemed satisfactory. There is now no reason to apprehend any difficulty with respect to the eventual success of the *Magicienne*. The mean speed realised was 18'591 knots on the measured mile, and 18'81 knots as measured by the log.

### HARTMANN'S GREY PAINT.

**M**ESSRS. Suter, Hartmann & Rathjen's Composition Co. Limited, of 18, Billiter Street, E.C., have recently called our attention to the fact that some nine months ago a Newcastle firm of shipowners painted half the inside of a new steel steamer before launching, with red lead and oil, and the other half with a paint just then being introduced by them under the name of Hartmann's Grey Paint. The result is, that the red lead and oil have practically gone, whilst the grey paint is sound, the metal under the latter being protected and in good condition.

As bearing on this, to all shipowners, important question, we may mention that in a paper read before the Institute of Naval Architects, at their last session in London, by Professor V. B. Lewes, F.C.S., F.I.C., Royal Naval College, on "The Corrosion and Fouling of Steel and Iron Ships," he explained that red lead and oil, by setting up a galvanic action, is converted into chloride of lead under the influence of moisture—depositing metallic lead and forming chloride of iron, the former acting injuriously on the metal.

### BRIGHTON AND HOVE INTERNATIONAL EXHIBITION.

**D**ETERMINED not to be behind the times, the inhabitants of Brighton and Hove have organised an exhibition which, judging from the particulars sent us, promises to be a big thing of its kind.

The Exhibition Syndicate (Limited), whose London offices are situate at 20, Bucklersbury, E.C., invite applications for space in the twenty-one sections into which the Exhibition is to be divided, and we doubt not but what, under the able superintendence of their experienced General Manager (Philip Sharpnel, Esq.), all these sections will ultimately prove well worthy of a visit.

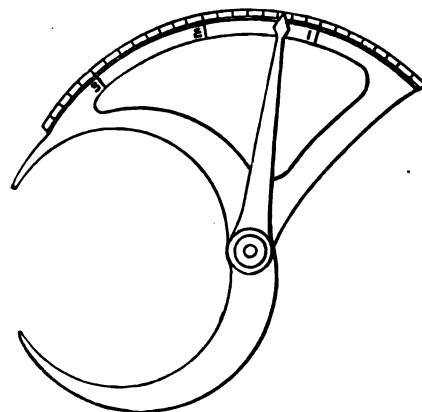
Briefly, we may state the sections which would appear likely to possess the most interest for our readers will be classified under their respective headings of—Electricity, Machinery, Fuel, and Marine, the intention evidently being to fully stock the sections relating to Machinery and Marine.

The Exhibition will open in October, and close in December, 1889, and we cordially wish the promoters every success in their venture.

### RICKINSON'S PATENT INDICATING CALLIPERS.

**W**E have pleasure in herewith illustrating a compact and ingenious form of indicating calliper recently brought to our notice by the inventor and patentee, Mr. H. Rickinson, whose London agent is Mr. H. Johnson, of 13, Wellington Street, Islington, N.

As will be seen the callipers are provided with a circular scale and indicator, and may be used without the aid of, that very often misplaced article, a rule. The scale may, of course, be marked with English or any foreign measure to order, thus rendering the article universally applicable.



They are constructed in two parts only, the same as ordinary callipers, one arm with circular scale in one piece of metal, and the other arm and indicator in another piece of metal, fixed together by pin and washer in the ordinary manner.

The scale in our illustration is drawn  $\frac{5}{8}$  of an inch to one inch, and it is obvious that when the arms are extended the distance from point to point is accurately shown by the indicator on the scale, a source of great convenience when minute measurements are required, as any error due to unsteadiness of the hand in taking measurements from the rule is avoided.

## THE YARYAN PATENT MARINE EVAPORATOR AND SEA-WATER DISTILLER.

WE recently inspected at the office of the British Yaryan Co., Limited, 39, Palmerston Buildings, London, E.C., the drawings of a marine type of their well known evaporator, a type the manufacture of which they are about to enter largely upon, and which has already been supplied, amongst others, to the North German Lloyd's Steamship Co.

As we purpose reproducing the drawings in an early issue, we will here restrict ourselves to describing the *modus operandi* and advantages of the Yaryan form of evaporator.

In this apparatus the water to be vaporized is introduced to the heated surfaces not, as is usual, in bulk, whereby the steam globules are imprisoned by the superincumbent mass of water, but in the form of a continuous spray, moving at a high velocity, and so allowing of the instant dissipation of a portion of the water in the form of steam; and by a very ingenious system of collecting chambers and "save-alls," the percentage of pure distilled water obtained is very high; in fact the Yaryan Co. guarantee that the duty performed per square foot of heating surface is more than twice that done in any other apparatus hitherto in use, thus reducing the size and weight of the evaporating plant necessary for a given amount of work.

As there is no "boiling down" of large volumes of water, there is no injurious deposit of salt, or "scaling," and consequently no falling off in the output of distilled water, which with the Yaryan is permanently maintained at its specified amount.

There is never more than a small quantity of water in the machine at any one time, and the circulation is throughout rapid and compulsory, the quantity of absolutely pure distilled water produced being very large, and far in excess of that produced by any other form of distilling apparatus of comparative size.

With this apparatus there is no reason why marine (or other) boilers should not always be fed with absolutely pure distilled water, as by a simple connection with the boilers, the whole of the boiling water can be redistilled at intervals, thus avoiding scaling and the expense and injury to the boilers arising from periodical scraping, while further, the oils used for lubricating, and which pass over with the feed water into the boilers, are entirely separated and removed by the Yaryan distiller, without sensible loss of heat, by means of a device which transfers the heat from the boiling water to the feed water. We were shown at the offices of the Company a sample of water so treated. The sample was six times the density of sea-water and a thick deposit of dirty decomposed oil was collected about the bottom of the bottle. With this means of getting rid of the oil, we doubt not but what that fruitful source of damage to boilers, "pitting," would be entirely overcome. Finally, we should say that the apparatus is not in its experimental stage, as its principle and action have been fully established in its wide and rapidly extending application to other and analogous processes.

## THE "NOMOS" COMPOSITION FOR SHIPS' BOTTOMS.

THE advantages that result from the application to the exterior of vessels' hulls of a thoroughly reliable anti-fouling paint are now so well understood, that we think no apology necessary for putting before our readers the following brief details respecting one particular composition of the kind mentioned, which has achieved a very distinct success. The "Nomos" composition, manufactured by Messrs. R. T. Bruce & Co., of Hull, which has been in the market for some years, is one of the few which has not only held its ground from the first, but has steadily made headway, until it is now one of the most popular protective paints in use for coating the bottoms of ocean-going steamers.

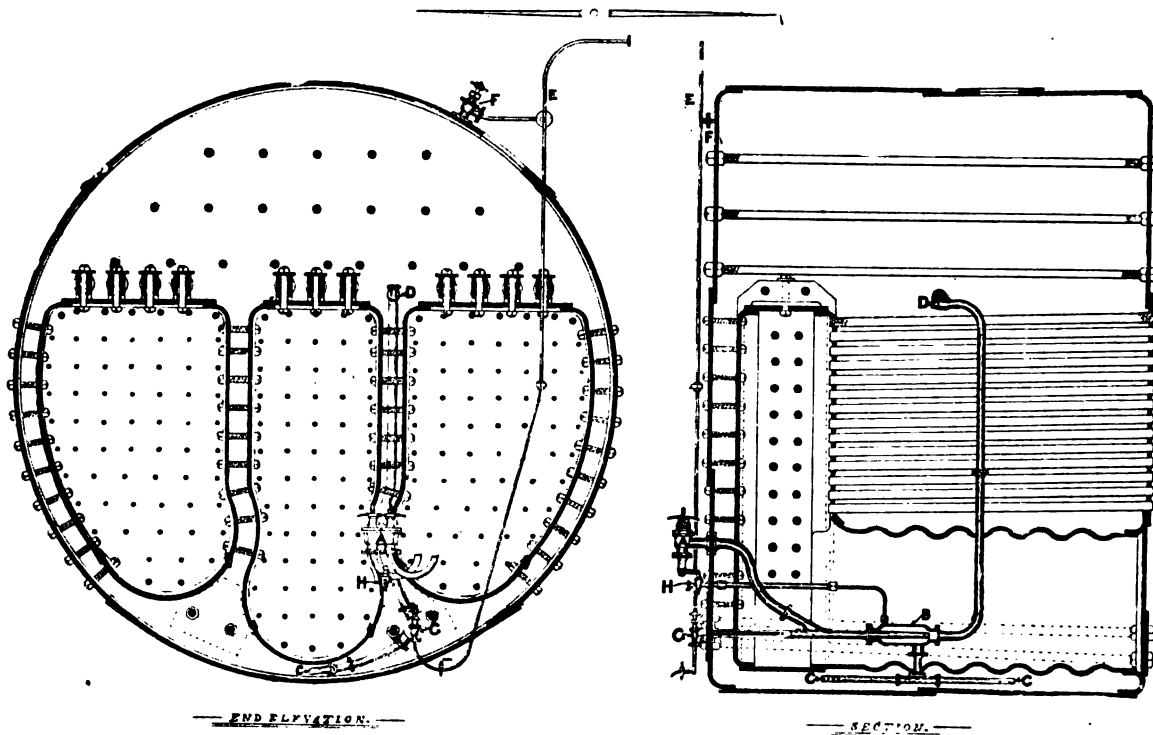
In the foregoing remarks it has been intimated that the excellence of the "Nomos" composition has been proverbial, we might, however, go further and state that its superiority over many rival compositions has been satisfactorily established, as there is plenty of evidence to bear out that assertion. To give one or two instances, the steamer *Birkhall* was docked on the Tyne in October, 1887, and her bottom coated with "Nomos" on one half of each side, in competition with, or as a test against another well-known composition. On the vessel being docked again, nine months later, it was found that the "Nomos" on each half of her bottom was nearly clean and almost free from shells, while the opposing composition was covered with barnacles. The same test was made a second, and subsequently a third time, with the ultimate result that "Nomos" has now (June, 1889), been applied to the whole of this steamer's hull. A similar test of "Nomos" against another composition was made on the s.s. *Royal Minstrel* at Hull, in June, 1887, and when the vessel was re-docked in the following year, "Nomos" was found to be best, and the whole of the bottom was therefore coated with it. Tests, with the same object in view, have also been made on the bottoms of the s.s. *Harlinger*, and the s.s. *Sailor Prince*, the result in each case being that the parts coated with "Nomos" were found to be in better condition than the portions coated with the opposing compositions. A very remarkable testimony to the estimation in which "Nomos" is held is to be found in the fact that out of 280 vessels coated in a period of seven months, over 120 had been coated with "Nomos" previously, and the result in these cases being so satisfactory as to induce the owners to use the same paint again in preference to any other. About 160 of the 280 vessels were coated in March, April, and May of the present year.

Up to the middle of June many more vessels had been contracted for. In reference to one of the liners, viz., the s.s. *Don*, belonging to the Royal Mail Steam Packet Co., it may be mentioned that she was coated with the composition in January of the present year and subsequently repaired and fitted with new boilers and triple-expansion machinery by Earle's Shipbuilding and Engineering Co., Hull. After which she made her official trial trip at Stokes Bay on Ap

14th (about three months after vessel was coated) when, in four runs over the measured mile, the highly satisfactory mean speed of 17 knots was attained.

Messrs. Bruce & Co. have had the satisfaction of receiving from a good many owners and masters of vessels appreciative letters, testifying to the remarkable qualities of "Nomos," after having been tried on prolonged voyages in all climates, and under almost all kinds of varying conditions. The best proof, however, of the good opinion entertained of this composition may be deduced from the fact that most of the orders given for it, during the past six months, have come from owners who had previously tested it against other compositions; that a very large proportion of the business now being done consists of *repeat orders*; and that the demand at all the centres, both at home

latest development of this most useful apparatus. From the illustrations, which show the apparatus as fitted to the inside of boilers, it will be seen that A is a check-valve chest to which the main and donkey feed-pipes are attached, and from whence the delivery pipe inside the boiler leads to a circulating chamber, B, provided with two suction pipes, C C, connected to the chamber. These pipes are perforated at the ends, and placed to draw the water equally from the bottom of the boiler through the circulating chamber, from whence it is carried with the feed up to the discharge valve, D, near the surface, where it commingles with the body of water in the boiler, and thus ensuring a perfect circulation through all the water spaces in the boiler. A steam pipe, E, leads to the steam connection on the donkey boiler, while F is a steam connection



and abroad, where agencies are established, is showing a progressive increase each month. In these days, when a good rate of speed is more than ever essential in steamships, a paint which assists the propelling power by keeping the bottom clean over a more than ordinarily long period, must be looked upon as an important aid to success, and basing our prophecy upon this view, we do not hesitate to predict for Messrs. Bruce & Co.'s speciality a much wider popularity than it even now enjoys.

#### THOMSON'S PATENT COMBINED CIRCULATOR AND FEED-WATER HEATER.

IN our issue for November, 1887, we described an invention of Mr. Daniel Thomson's for maintaining an absolute circulation of water in steam boilers; and we now have pleasure in illustrating Mr. Thomson's

on the main boiler or superheater; from thence the pipe leads to a valve, G, connected with the internal feed-pipe. A test-cock, H, leads to the circulating chamber, and allows of any accumulation of air being expelled from the chamber, and the temperature of the feed-water being tested. Before lighting fires on main boilers, steam is admitted through the connection E, leading from donkey boiler, through the valve G, into the internal feed-pipe, so circulating the water from the bottom to the surface of the water in the boiler, and heating the whole to a uniform temperature. When the boiler is under full pressure, and the feed-pumps are working, steam is admitted through the connection F to heat the feed-water and increase the circulation. It will be seen that not only does this apparatus thoroughly circulate and heat the feed-water, but it also raises the saline matter and other impurities to the surface of the water, whence they are readily "scummed" off, and so the necessity for

zinc plates and boiler compounds is done away with, and the liability to prime is obviated. The engines being always supplied with clean steam, the wear and tear of pistons and valves is reduced to a minimum. The condenser is kept free from deposit, and fuel is saved.

Mr. Thomson has received many highly satisfactory testimonials, and chief amongst them are those from the engineer officers of the s.s. *John Pender*, and s.s. *Mirror*, of the Eastern Telegraph Co.'s fleet.

The officers of these ships, in reporting to their company, not only speak most highly of the merits of the invention, but they give some highly interesting data, some of which we here reproduce. They speak for themselves, and need no comment from us.

Result of trial, made by Mr. H. P. Sherlock, Chief Engineer of s.s. *John Pender*, April 26th, with fires lit

be made to Mr. Thomson, at 85, Canton Street, Poplar, E., who will be pleased to furnish further particulars of this most useful invention.

### MACHINERY AT THE PARIS EXHIBITION.

MESSRS. SELIG, SONNENTHAL & Co's EXHIBITS.

ALTHOUGH the Palais des Machines, or Anglicised, the Machinery Hall at the Paris Exhibition, contains few exhibits directly illustrative of Marine engineering, it is to be questioned if on any occasion there has been gathered together such a large and varied assortment of machine tools useful to engineers, shipbuilders, etc. Firms of standing from

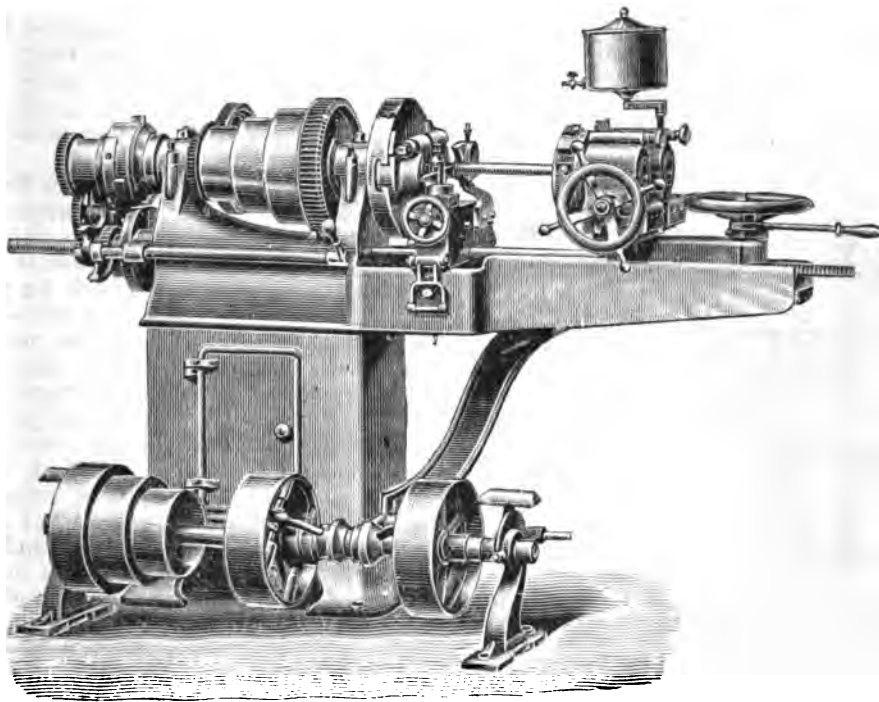


Fig. 1.

in port boiler, and circulator working with steam from donkey boiler. Quantity of water in main boiler 13 tons.

Time.	Steam on Donkey Boiler.	Temperature of Water in Boiler Bottom.	Steam on Main Boiler.
10.30 a.m.	40 lbs.	50°	
11 "	"	86°	
11.30 "	"	124°	
12 "	"	174°	
12.30 "	"	212°	8 lbs.
1 p.m.	"		50 lbs.

Main Boiler fires lighted 10.25 a.m.

Coals consumed in Donkey Boiler during trial, 1½ cwt. per hour.

To all interested in the question of prolonging the life of boilers, we would recommend application to

several Continental countries as well as Great Britain and the United States are represented, and we hope to be able to illustrate and describe many of their most important exhibits.

Amongst the exhibitors in the British section, Messrs. Selig, Sonnenthal & Co., engineers and merchants, 85, Queen Victoria Street, and Lambeth Hill, London, have one of the largest stands, entirely occupied by machine tools and their accessories. As, however, a full description of the numerous articles exhibited by this firm would require more space than we have at command, we are, therefore, only able to select a few examples of the many excellent tools they have on view.

The "Victoria" is an improved bolt-screwing and nut-tapping machine, which is now exhibited for the first time, and is only being introduced to notice. It is illustrated in Fig. 1, and as shown, is provided with

opening dies, cutting off attachment, extra chuck on back end of spindle, leading screws and gears. As in all recently designed and most approved machine tools of this type, the spindle is hollow for its entire length, the hole being  $2\frac{1}{2}$  in. diameter, so that it is capable of screwing large and small work from  $\frac{1}{4}$  in. to 2 in. diameter. Special attention has been given to the designing and construction of the chuck, with the result that it is well adapted to hold efficiently work of irregular shapes as well as of varied sizes. The attachment for cutting off bars in front of the chuck is hinged, so that it can be removed when necessary. It will be noticed that powerful back gearing is provided which has to be thrown out of

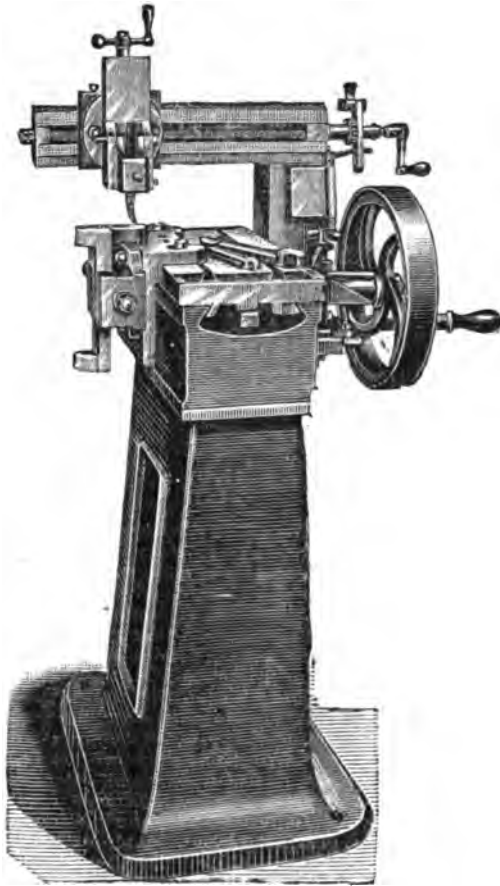


Fig. 2.

gear, as in an engine lathe, for small work. The dies are carried in two equal disks set side by side, and brought together or separated by a right and left screw, each die being divided, the half in one disk opposite to the half in the other, in such a manner that a complete working die is made by bringing the disks together to the stops, and the finished screw released by separating them, thus saving the running back over the screw. Each die has its independent stop pins controlling its cut, which are readily shortened or lengthened, enabling a perfect adjustment to be maintained, all the different dies standing ready for use, so that any size may at once be brought into line by turning the disks to the proper places. For ensuring accuracy in

difficult work, such as long, coarse or square-threaded screws for various purposes, rarely if ever successfully cut with dies previous to the construction of the "Victoria" bolt-screwing and nut-tapping machine, a leading screw and change gear is provided, with special and very rapid clutch arrangement, enabling such work to be done with this machine, not only in the most accurate manner but also with great economy, without the use of the lathe.

The space occupied by the Victoria machine, at the Paris Exhibition, which we illustrate, is about 7 ft. by 2 ft., and we need scarcely say that the machine is well worthy the attention of all interested.

The "Eureka" planing machines are important specialities for which Messrs. Selig, Sonnenthal & Co. are the sole licensees. They are variously adapted for treadle, hand, and power driving, and a number of them are exhibited. In our illustration, Fig. 2, there is a representation of a hand-driven "Eureka" planing machine, which can, when desired, be driven by belting off the shafting in the engine shop, the flywheel being designed for that purpose, no pulley being required. When thus driven by power, the advantages as compared with ordinary planing machines, fitted with three pulleys, are considerable. Reverting to our illustration (Fig. 2), it will be seen the machine represented is an open side planer, supplied with a parallel vice and also with an angle plate to bolt on the side of the machine. By this arrangement the vice can be fixed on the table to hold work for planing horizontally, or it can be fixed on the side of the machine to hold work vertically, so as to plane the ends of same, the latter operation not being possible in the ordinary planing machine, but requiring usually to be executed on a shaper. It may be pointed out, that to ensure sufficient rigidity when working, the arm of this machine is strongly ribbed at the back. Screw keys, a combined parallel and swivel vice, easily removable from the table, and a set of six planing tools, are provided with this machine, and when desired, a two-speed slot drilling apparatus for grooving holes  $1\frac{1}{2}$  in. deep,  $\frac{3}{4}$  in. wide, in plates, castings, &c., up to 11 in. by  $7\frac{1}{2}$  in. in length and breadth. The larger "Eureka" machines can do work similarly on articles  $31\frac{1}{2}$  in. in length, 15 in. in breadth, grooving to a depth of 3 in. and a width of  $\frac{3}{4}$  in.

The "Sundale" patent twist drill grinder (Fig. 3) for grinding twist drills, with a differential clearance, is the third speciality exhibited by Messrs. Selig, Sonnenthal & Co. we single out for notice. Nothing is so important for the successful use of twist drills as having them properly and truly ground. In the old, complicated, and incomplete method adopted in other machines—viz., that of imitating the peculiar movement of the skilled mechanic in grinding twist drills—the results are frequently far from satisfactory. The "Sundale" patent twist drill grinder avoids the whole of these difficult and complicated movements of the drill, by moving the emery grinding wheel unerringly in the curve of the clearance instead of moving the drill, so that with this machine a labourer or boy can grind a twist drill as well and accurately as a skilled mechanic, and give the proper clearance the same as in a new twist drill. In order to facilitate the re-grinding of drills, some makers have adopted a grinding line, which, however, weakens the drill, and

frequently causes them to split; but by using the "Sundale" patent grinder, there is no necessity for the grinding line, as drills without it can be as accurately ground as those provided with it. Both lips are ground to the same angles—90 degrees—and with the same clearance, the grinding and curving of each lip of the drill being performed automatically in one operation, while the amount of the curve can be varied mechanically according to requirements. In operating with the "Sundale" patent grinder, the twist drill to be sharpened is simply

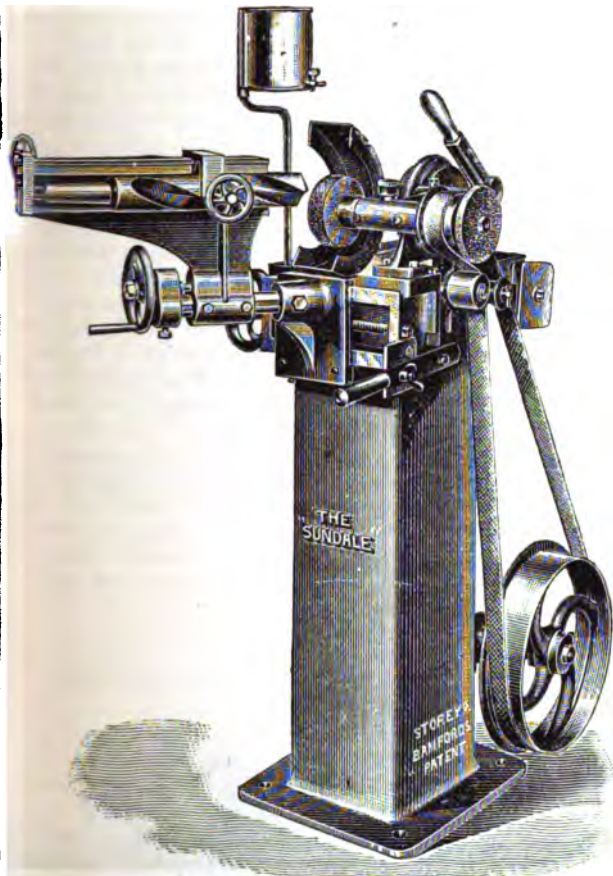


Fig. 3.

clamped in a V-shaped rest, a small slide fitting into the groove of the drill to bring the same into position. After grinding one edge, the drill is rotated until the small slide fits into the opposite groove, thus insuring a rotation of 180 degrees. An adjustable stop butts up smoothly against the shank, so that when the drill is rotated, it is held in exactly the same position for grinding both sides. By moving the lever, which is connected with a vertical slide, shown on the side of the machine, more or less curve can be given to the drill, to suit various kinds of metal. A graduated index shows the usual amount of clearance for different sizes of drills, one of the machines exhibited on Messrs. Selig, Sonnenthal & Co.'s stand being intended for grinding drills of  $\frac{1}{4}$  in. to 2 in. diameter. This machine weighs about  $2\frac{1}{2}$  cwt., the other for lighter work is about 1 cwt. less weight. Wherever

this "Sundale" patent twist drill grinder has been adopted it has given great satisfaction.

Sonnenthal's New Radial Cold Sawing and Milling Machine, for cutting iron and steel plates, square and round bars, castings, etc., has special features. The machine of this type, shown in our illustration, Fig. 4, is the smallest of six sizes that are manufactured, and can be obtained for hand and steam power, or for either hand or steam only. It weighs only 4 cwt., and requires about 1-10th of a H.P. in cutting the largest section,  $4\frac{1}{2}$  in. Two tables, it will be seen, are provided, and on the bottom one, with medium-sized saws—say 9 in. clear—the machine will cut up to

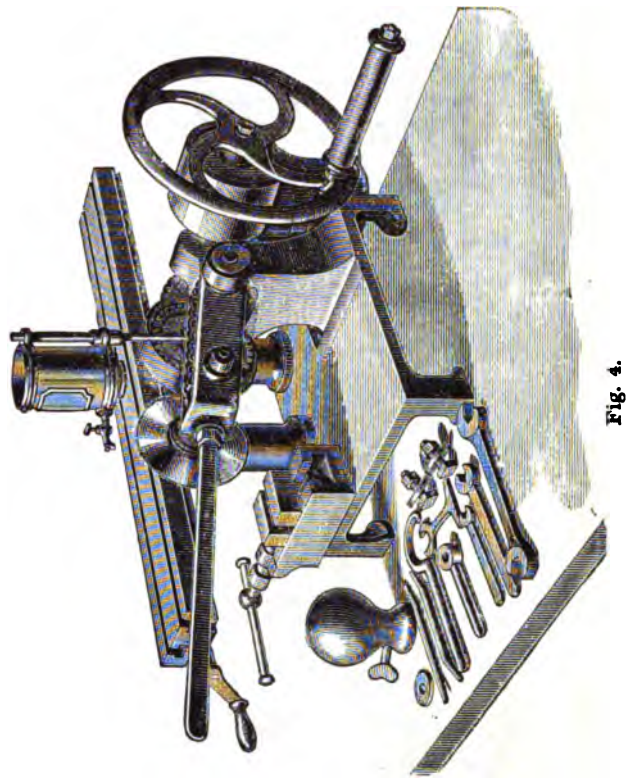


Fig. 4.

$2\frac{3}{8}$  in. high by  $4\frac{1}{2}$  in. wide. The upper table is arranged for turning back out of the way when large pieces are being cut on the bottom table. On the upper one large and heavy castings, plates, etc., can be cut with medium-sized saws up to  $2\frac{3}{8}$  in. high by  $23\frac{1}{2}$  in. wide. Messrs. Selig, Sonnenthal & Co. do not recommend the use of saw blades of the largest diameter; but if used in this, the smallest of these machines, a 12-in. saw will cut up to about  $4\frac{1}{2}$  in. On the average the saws cut a surface of about 1 inch square per minute, but if the saws are new and sharp they cut quicker; and as they are driven at a moderate speed, 20 revolutions per minute being the maximum, the material being almost milled rather than sawn, the longevity of the saw is promoted. While this machine can be used like an ordinary cold sawing machine, cutting downwards, it can also be employed like a Universal machine, cutting upwards. The length of the upper table on the Sonnenthal's New Radial Cold Sawing and Milling Machine we

illustrate is 3 ft. 4 in., and the breadth 6 in. The largest machine of this type has a table 10 ft. long and

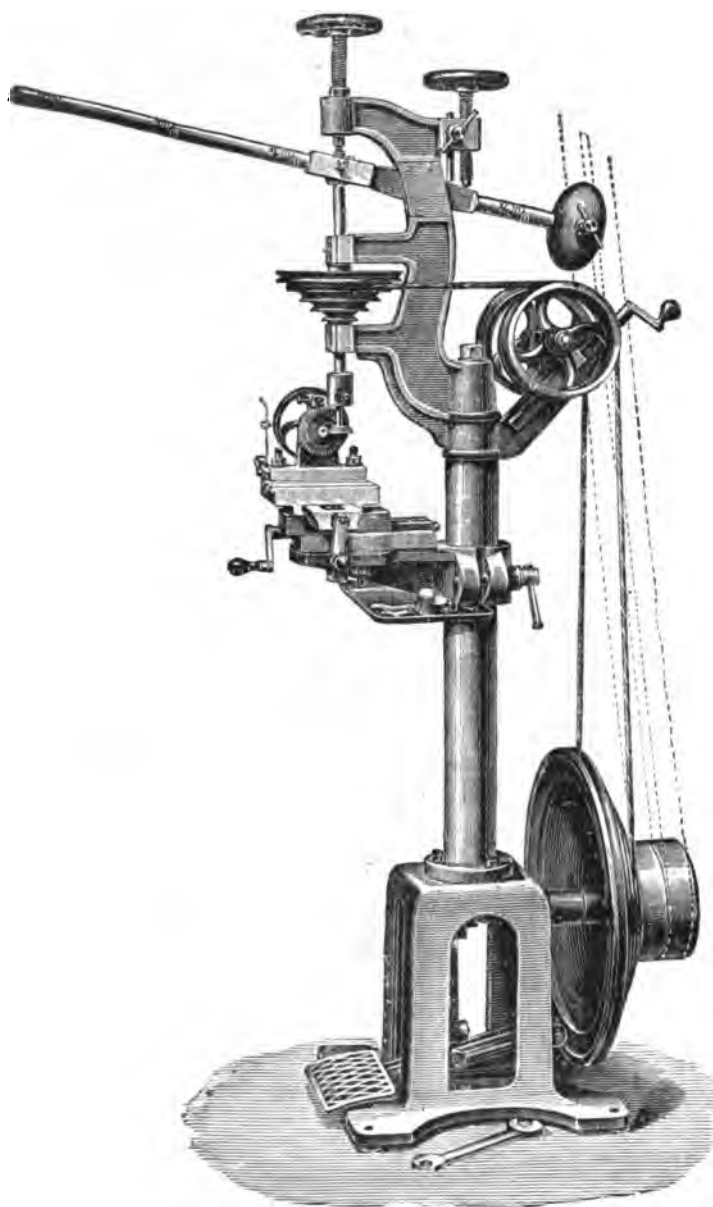


Fig. 5.

1 ft. 6 in. wide, and can cut sections up to 14½ inches square. The revolutions of the saw are stipulated to be as low as four or five per minute in the largest size machine for wrought iron and soft steel, slower for hard steel, and somewhat more rapid for brass, copper, &c.

The patent "Victoria" Quick Speed Drilling Machine, of which Messrs. Selig, Sonnenthal & Co. are the sole licensees, is represented on the firm's stand in various sizes. Our illustration, Fig. 5, is taken from No. 1, and is one-twelfth the size of the actual machine, which in addition to being fitted, as will be seen, with a compound slide rest, making the machine available as a slot drilling and milling machine, is also supplied with graduated dividing apparatus, so that on it all toothed

wheels and milling cutters up to 6 in. diameter, can be made quickly and accurately. The machine proper is apparently of strong and accurate construction, and is driven by a twisted leather belt, running on grooved cones, so arranged as to enable the speed to be varied without altering the length of the belt. To increase or decrease the speed for small or large holes, the slide, which is graduated, is screwed to the mark indicating the size of the hole to be drilled, the belt can then be shifted to the pullies forming the right angle. For small holes up to ½ in., the feed can be made automatic, by changing the sliding weight from one end of the lever to the other and fixing the same to any of the divisions marked thereon, for 1-32 in. hole the weight of the lever being quite sufficient. By an ingenious arrangement the spindle and drill is prevented from suddenly dropping through the hole that is being drilled, so fruitful a cause of small drills being broken. The drill spindle runs in adjustable bearings, and as a universal drill-chuck is supplied with each machine as well as a steel "centre" for drilling between centre and drill—these appliances admit of very accurate work, which otherwise could only be done in the lathe. The table can be raised or lowered on the pillar 24 inches, and it will be seen that the machine is adapted to be either driven by the treadle or by belting (shown in dotted lines) direct from the main shaft, no special overhead motion being required. The machine, as shown in our illustration, drills holes from 1-64 in. to ⅜ in. diam., and weighs about 3½ cwt.

Messrs. Selig, Sonnenthal & Co., besides exhibiting machine tools, have a variety of smaller specialities on

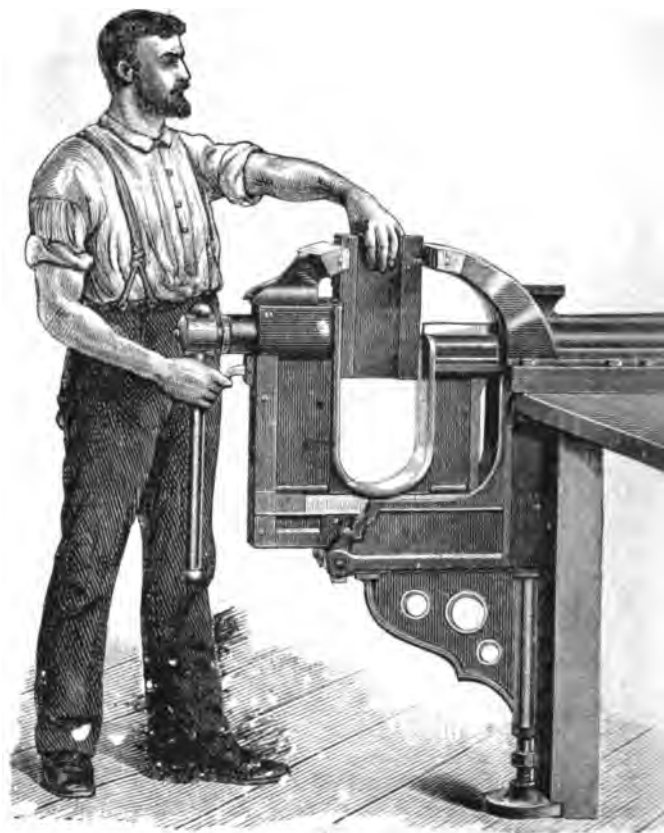


Fig. 6.

their stand, including tube expanders, scrapers, pulleys, mandrils, tool holders, drills, chucks, in many varieties, hand vices, machine vices, and in nearly every instance these are patented articles, but limits of space precludes a description of but a selection of these specialities, and we must content ourselves with, in closing our notice of their interesting, carefully designed and well constructed exhibits, with giving a description of the Patent Deep Gap Sudden Grip Parallel Vices, an illustration of one of which, weighing about 500 lbs. will be found on Fig. 6. These vices are made almost entirely of cast steel or of malleable steel castings of the highest quality and are very simple in manipulation. By taking hold of the lever and raising the trigger with the fore-finger, as shown in Fig. 6, the movable jaw may be readily drawn out as far as necessary to admit the work between the jaws. If the lever is then given a slight turn the work is sufficiently gripped. One turn of the lever to the left is sufficient to release the work. The width of the jaw in the vice illustrated is  $8\frac{1}{2}$  in. and it opens to 13 in., the depth of the jaw being  $19\frac{1}{2}$  in. Besides the advantages already indicated, it may be pointed out that the deep gap allows of many articles being gripped in the centre, which could not be so held in an ordinary vice, owing to the screw interfering. Again, large or small articles can be instantly clamped and released with one hand, so leaving the other hand entirely free to hold the work, and what is of great importance is that none of the working parts are exposed to dust. Messrs. Selig, Sonnenthal & Co. guarantee every vice to be sound when sent from the works, and exercise the strictest supervision over the smallest as well as the largest articles which they supply to their numerous customers in all parts of the world.

### MORTON'S PATENT VALVE GEAR.

OF valve gears it may truthfully be said that their name is legion, but it is a *rara avis* amongst them that will give us an absolutely uniform motion of the slide on both the in and out ends of the piston's stroke, and consequently exactly the same result whether running ahead or astern.

We have seen many diagrams, as given by various gears, and taken both when running ahead and astern, but we must confess, that until we saw those given by Morton's gear, we had seen few, if any, that gave the much to be desired uniformity of result, irrespective of the direction in which the engines were running.

We hope shortly to publish an illustration of the triple-expansion engines of the s.s. *Humber*, now building on the Clyde, and fitted with Morton's gear. (and we may here state that there are now building on the Clyde engines equalling 14,000 I.H.P., all of which are being fitted with this gear).

By reference to the accompanying diagrammatic figures it will be seen that this gear differs from the well-known Hackworth, Walschart, Brown, and Joy types, in that it has no eccentrics, or angle cross slide, or sliding dies, its chief feature being the method adopted to correct the angularity of the

connecting-rod and the arrangement of the mechanism for maintaining that correction, whether the engines be working in forward or backward gear, or at any intermediate grade of expansion.

By this means equal port opening for both ends of the cylinder are given, or by a suitable proportioning of the parts the steam may be allowed to follow the piston further on the upstroke than on the down, a desirable arrangement with inverted cylinder engines. The lead is constant, and the motion of the valve is such that wire drawing and cushioning are reduced to a minimum, while the movement of the valve being

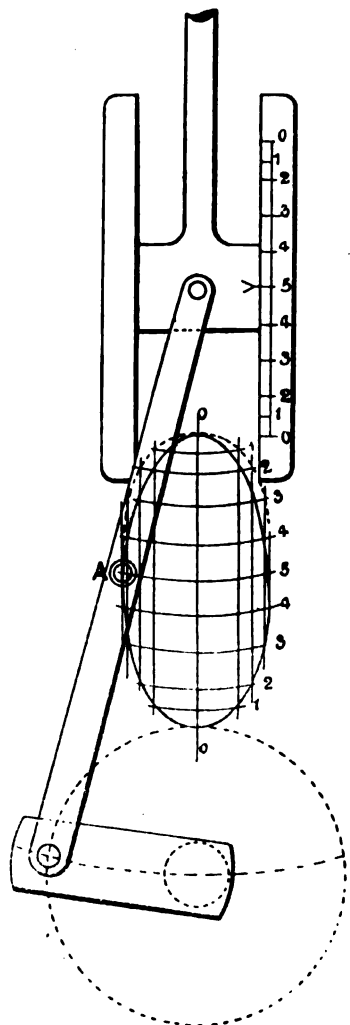


Fig. 1.

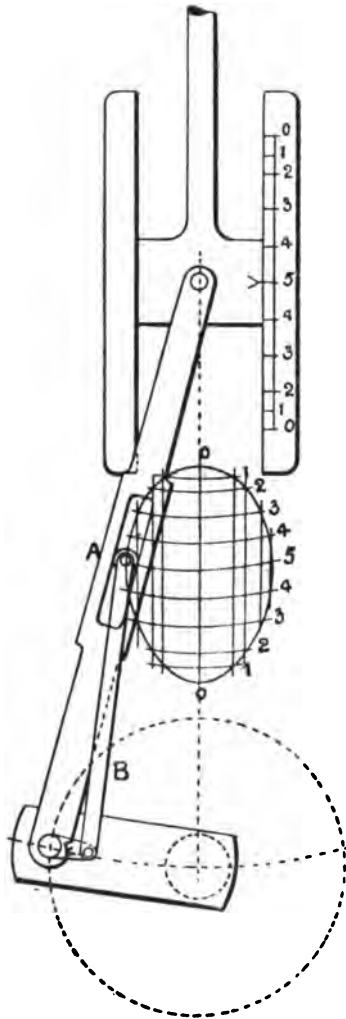
in unison with the stroke of the piston, and not with the crank or eccentric, as in other systems, ensures a more regular distribution of the steam.

In Fig. 1 is shown, by the full line, the irregular path described by a fixed point, A, on the line of the connecting-rod, whilst the dotted outline shows the path that would be traced if the angularity of the connecting-rod were corrected, both ends of the elliptical figure then becoming alike.

From this it was found that when for a fixed point on the line of the connecting rod, a movable point, as at A, Fig. 2, was substituted the angularity of the con-

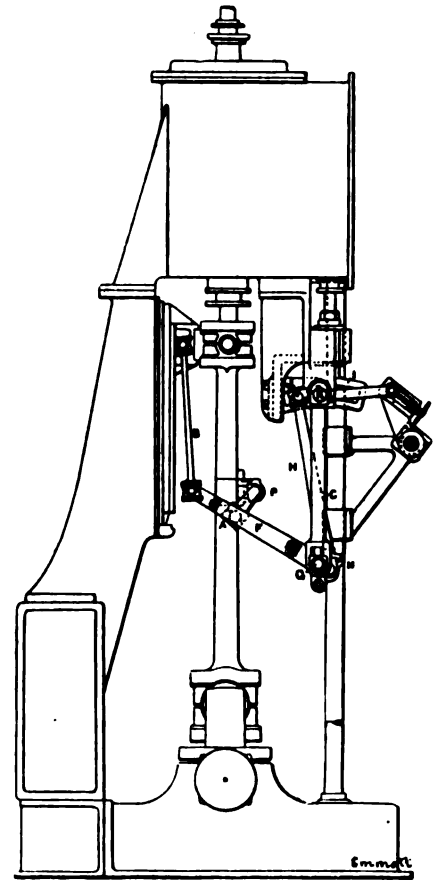
necting rod was effectually corrected, and the elliptical figure became exactly alike at both ends, as represented by the outline path shown in Fig. 2. In this figure the ordinates 1, 2, 3, 4, 5, intersect each other, and agree exactly with the position of the piston marked 1, 2, 3, 4, 5 on the guide bar.

The movable point, A, receives its motion from an overhung, or return crank, E, on the crank pin of the engine through the link, B. (The return crank, E, has been generally adopted for all outside cylinder locomotives, and single crank engines); but for inside cylinder locomotives and marine engines, where the cranks are



**Fig. 2.**

double, the movable point, A, receives its motion from the cross head, as shown at Fig. 3, it being understood that in practice the movable point does not slide in the connecting rod (as shown diagrammatically by Fig. 2), but takes the form of a radiating spanner, P (Fig. 3), the centre, A, of the spanner receiving the necessary movement to correct the angularity of the connecting rod, either from the return crank or piston rod cross head as shown. The short lever or spanner, P, centred on the connecting rod receives its point on the valve lever, F, the proportion that the versed sine of the spanner,



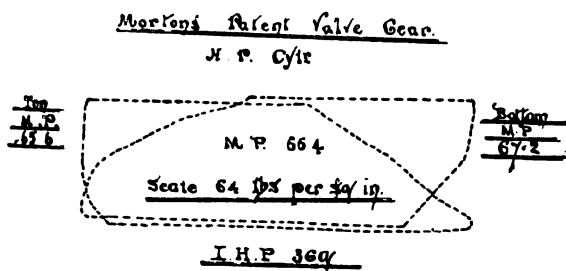
**Fig. 3.**

in backward or forward gear, or linked up to any intermediate position.

The reversing portion of the gear consists of a sliding quadrant, I, properly secured so as to form part of the slide valve spindle and to slide with it, a bracket forming the guide for the valve spindle and quadrant, the adjustable link, H, and die block, J, being connected with the starting engine or hand-reversing gear.

By adopting this new form of valve gear, marine engineers will effect a saving of space and weight, while the absence of wear and tear is well testified to by the fact of its having been in constant Trans-Atlantic use for many months, during which time the wear has been practically nil, and the cost of adjustment trifling.

This gear has made great progress on the Clyde. Those steamship owners who are converting their compounds to triple-expansion engines will economise space by using Morton's gear on the additional engine. We publish herewith an indicator diagram taken from the *Clan Gordon*, which, under the superintendence of Mr. John Lyall, has, along with several sister ships, been so tripled.



Cylinders, 22 in., 34½ in., 59 in. Stroke, 42 in.  
Steam pressure, 150 lb. 1st Recr., 62 lb. 2nd Recr., 7½ lb.  
Revolutions, 69. Vacuum, 26".

For further particulars we would refer our readers to Mr. Robert Bruce, engineer to the proprietor of "Morton's Valve-gear Patents," of 70 and 71, Bishopsgate Street Within, E.C., to whose large sized models, and courtesy in explaining the same, we are indebted for our information.

### NON-CONDUCTING COVERING FOR STEAM PIPES.

WE have pleasure in giving herewith the results of some interesting trials carried out by Messrs. A. Haacke & Co., of Kieselguhr Wharf, Hackney Wick, London, E., with the view of accurately measuring the amount of heat lost by radiation and convection from steam pipes.

The trials, four in number, each extended over several hours, and were made with intervals of several days between, so as to ensure the most accurate results, and were directed to determine the relative losses from (1) bare pipes; (2) pipes covered with 1 in. of fossil meal composition; and (3) pipes covered with 1 in. of fossil meal composition and three layers of hair felt. So as to render the method of testing more intelligible to our readers, we herewith give a plan and elevation of the apparatus used, and from which it will be seen that the testing surfaces are represented by three cast-iron steam pipes, 5 in. internal diameter and 6 ft. long, with blank flanges on each end. These pipes were suspended from the roof by two stout lengths of hoop-iron, fitted with clips and bolts, so as to allow of the pipes being raised or lowered into their proper position.

The 1-in. steam-pipe was carried direct from the top of a vertical 12-horse boiler, and led to a McDougall's steam drier connected with a McDougall's steam trap, to ensure dry steam for testing, the steam-pipe as well as the drier being covered with 1 in. of fossil meal composition, and 1 in. of hair felt and canvas.

After the steam passed the steam drier, it entered into a cross piece from which three short lengths of ½-in. pipe conveyed it to the three respective test-

pipes, each ½-in. pipe being provided with a stop-cock, s, and air-pipe, a.

The top flanges of the test-pipes were about 1 ft. apart, and the lower flanges about 3 ft., the fall from the steam drier to the top of the water-collector being 3 in. in every foot. From the lowest point of each test-pipe a short length of ½-in. steam-pipe led to a cast-iron cylinder 14-in. high by 12-in. internal diameter, with blank flanges on top and bottom, and valves for shutting off the steam both immediately over the top flange and below the bottom flange. These three cylinders were provided to catch the water condensed in the three ranges of pipes, and had gauge-glasses to show the height of water, and vent-cocks for blowing off the air.

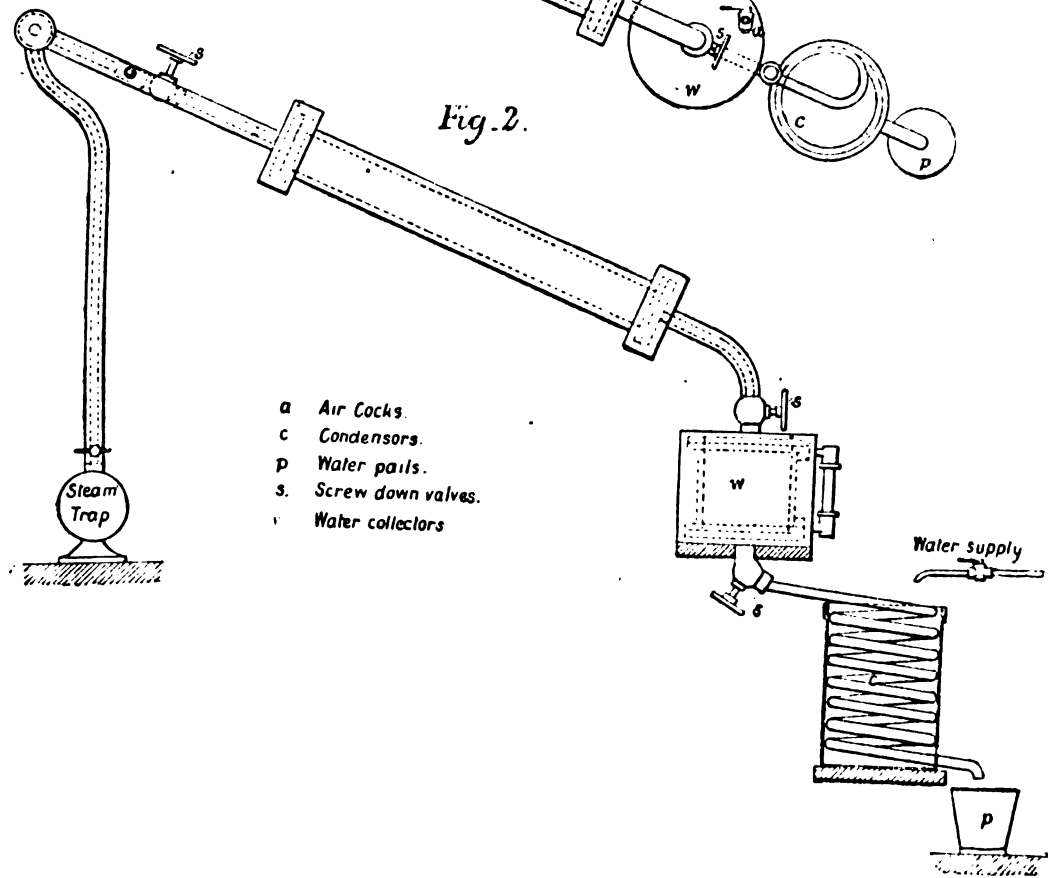
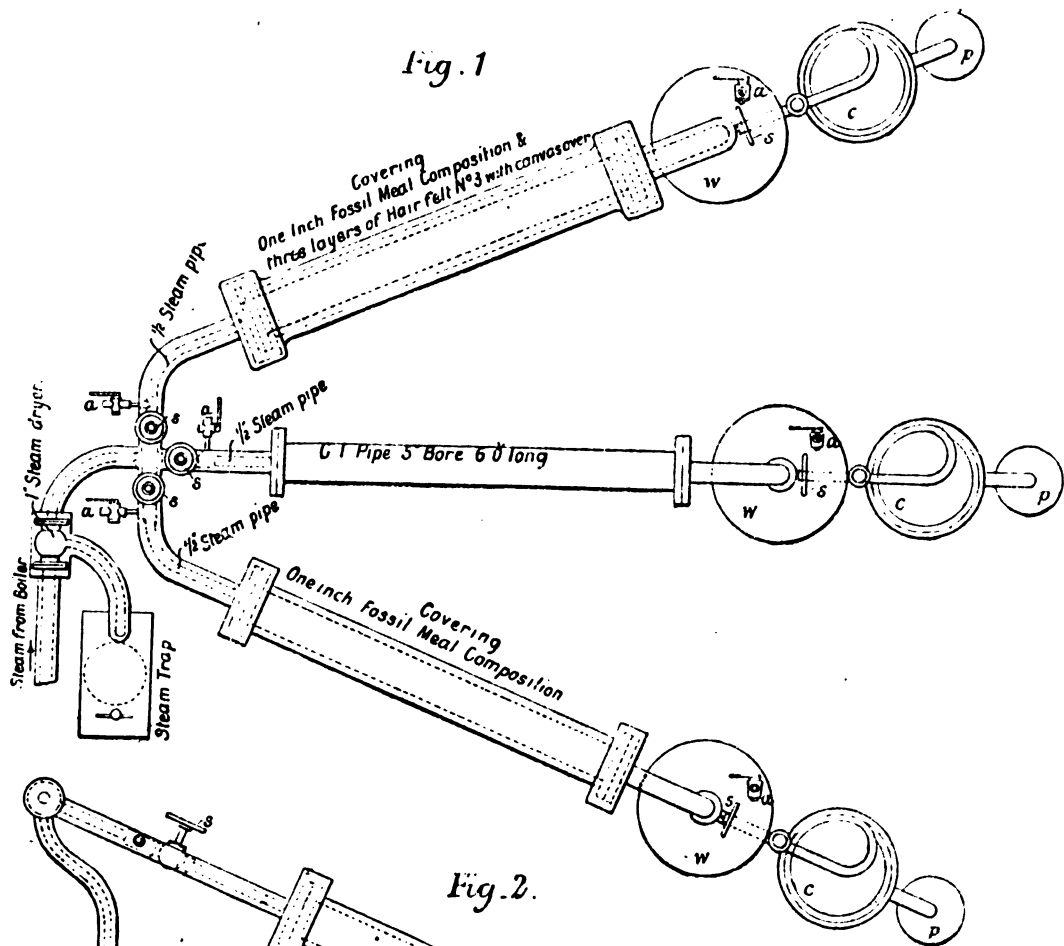
From the lower valve an ½-in. pipe connected the cylinder with a cooling arrangement, viz., an ½-in. copper worm, 30 ft. long, fitted in an ordinary petroleum barrel in such a manner that every foot of pipe had a fall of at least 1 in. The end of the pipe projected from the lower part of the barrel, and the condensed water was delivered into pails and weighed. All the ½-in. connecting pipes, as well as the water collecting cylinders, were covered in the same manner, viz., 1 in. of fossil meal composition and 1 in. of hair felt and canvas, so as to reduce the loss of heat from these surfaces to a minimum.

The coverings used on the test pipes during the trial are specified on the drawing, but as the surfaces and covering of the ½-in. connecting pipes and water collectors were the same in all three ranges, it became necessary to calculate what per-centage of the condensation in No. 3 range is due to loss from the test pipe, and which proportion must be put down as due to the supplementary parts, for this further portion must evidently be deduced from all three ranges in order to give accurate results.

Briefly we may state that the area of the heat losing surface on each range of the apparatus was 12.33 square feet, and that the area of the supplementary surfaces was 14.16 square feet, or a total for each range of 26.49 square feet.

Allowing for the supplemental portions, the amounts of condensed water drawn off were 13.44 lbs., 81.82 lbs., and 6.7 lbs. respectively; or, in other words, a covering of fossil meal composition 1 in. thick saves out of the total possible loss of 100 per cent. as much as 83.57 per cent., and if over this covering 1½ in. of hair felt is placed with canvas, the extra saving is only 82.5 per cent., or 91.82 per cent. out of the total loss.

It needs but a simple arithmetical demonstration to show the importance of these figures, for if 81.82 lbs. are condensed by 12.33 square feet in ten hours, it is evident that 5,808 lbs. are condensed by every square foot in a year of 365 days, and assuming 1 lb. of coal is required to evaporate 8 lbs. of water into steam 60 lbs. pressure, then 6½ cwt. of steam coal are required every year to make good the loss of heat from every square foot of uncovered steam-pipe, a loss which will be greater in winter or in colder climates, or where higher pressures are employed. We are sure these figures cannot but prove interesting to our readers, whose thanks are due to Mr. Albert Haacke for giving so much time to carrying out the experiments.



Mr. Haacke combats the opinion firmly established in the minds of many steam users, namely, that the outside temperature of a non-conducting composition is a measure of its efficiency, on the following grounds: 1st. Thicker coverings give greater circumference, and consequently more heat-losing outside surface. For instance, a 2-in. steam pipe measures per running foot, if covered 1 in. thick, about 1.18 square feet; if covered 2 in. thick, about 1.70 square feet; provided the two coverings had the same ability of giving off heat from equal areas, then the temperature ought to be, if 100 deg. above freezing point on the thin composition,  $\frac{100 \cdot 118}{170} = 70$  deg. only, above freezing point on the larger surface, or, say, 132 deg. Fah. and 102 deg. respectively, in order to transmit the same amount of heat from the pipe.

2nd. Good non-conductors will not allow the heat to escape quickly, but retain it in the surface just as tenaciously as in the interior; in that case the supply of heat from the steam inside is greater than the loss of heat from the surface, and consequently the outside feels warm.

Inferior non-conductors, however, give the heat from the surface quicker to the surrounding space than it can be supplied from the interior source of heat; thus it can happen that the outside surface feels cooler, when in fact it loses more heat than the better covering.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from May 25th to June 24th, 1889.

Armstrong, Jas., engineer to the *Glutton*, to date June 24th.  
 Austen, Edward J., engineer to the *Widgeon*.  
 Bond, Wm., engineer to the *Prince Albert*, to date June 24th.  
 Curtis, Fredk. T. W., engineer to the *Black Prince*, to date June 24th.  
 Elbow, Geo., chief engineer to the *Bellona*.  
 Gedge, Henry A., acting assistant engineer to the *Medea*, to date May 28th.  
 Head, Ernest A. W., acting assistant engineer to the *Medea*, to date May 28th.  
 Henwood, John W., chief engineer to the *Ready*, reappointed on promotion, to date May 7th.  
 Hughes, Thos. C. E., engineer to the *Plover*, to date July 3rd.  
 Highton, Francis W., engineer to the Hong Kong Yard, to date May 30th.  
 Hills, Alfred, assistant engineer to the *Raccoon*, to date June 18th.  
 Hines, Wm., engineer to the *Wizard*.  
 Hudson, Wm., engineer to the *Inconstant*, to date June 24th.  
 Irvine, Wm., engineer to the *Hydra*, to date June 24th.  
 Lane, Jas., engineer to the *Gorgon*, to date June 24th.  
 Lerg, Jas. C., chief engineer to the *Medea*, to date May 28th.  
 McCarthy, John, chief engineer to the *Prince Albert*, to date May 28th.  
 McLean, Harry C., engineer to the *Pigmy*, to date July 3rd.  
 Mitchell, Fredk., engineer to the *Mercury*, to date June 24th.  
 Nicholson, Jas. D., chief engineer to the *President*, additional, to date June 4th.  
 Norris, Colin M. K., engineer to the *Foxhound*, to date June 4th.  
 Parsons, Wm. G., chief engineer to the *Nymph*, to date July 3rd.  
 Parkis, Jos. T., engineer to the *Victoria and Albert*, to date June 4th.  
 Sashbrook, Henry S., engineer to the *Elgin*.  
 Sawlinsion, Walter W. H., engineer to the *Asia*.  
 Short, Edward A., engineer to the *Conqueror*, to date June 18th.

Stewart, Charles E. (b), engineer to the *Spider*.

Tompkins, Albert E., engineer to the *Medea*, to date May 28th.

Wisnom, Wm. M. K., assistant engineer to the *Nymph*, to date July 3rd.

### HOAR & BROWN'S HARDWOOD MARKET REPORT, June 24th, 1889.

TEAK.—The deliveries for the last four weeks ending the 21st inst. were 753 loads, and for the first five months of the year 5,806 loads, against 6,809 loads in 1888 and 4429 loads in 1887.

The Stocks on the 1st June were:—

1889.		1888.		1887.	
Logs.	Planks.	Logs.	Planks.	Logs.	Planks.
3,738 Lds.	1,228 Lds.	7,337 Lds.	835 Lds.	11,763 Lds.	1,454 Lds.

The present stock is, therefore, very small indeed, and, with the very large deliveries that are taking place at present, it will be still further considerably reduced.

Although there has been a short lull recently in the market, we may look forward shortly to renewed activity, and consequently higher prices, owing partly to the Government having invited all our principal shipbuilders to tender for the supply of a large portion of their requirements. Then, again, London having been successful in securing large foreign orders, we may safely predict that prices will continue firm, with an upward tendency.

GREENHEART.—There is no change in prices, and nothing of any importance to report.

MAHOGANY.—The market is again active. Several large parcels have changed hands, and there still remains a fair demand for cargoes among dealers. Prices bid fair to remain very firm.

AMERICAN OAK.—Imported boards, planks, and logs from the States are selling at very low prices, which will check further importations for the present.

WHITEWOOD.—Both planks and boards are doing a good trade at very fair prices for the shippers.

WALNUTWOOD.—Logs are still going badly, there being but little demand. Imported boards and planks take the precedence, and a good business is being done in these. Prime to medium parcels are still required.

ELM.—Fresh imports have just arrived, and a fair demand shows itself at profitable prices.

The market generally is good, and there is every prospect of it continuing so during the present year.

### INDUSTRIAL AND TRADE NOTES.

#### THE CLYDE AND SCOTLAND.

THE Rivetter's Strike continues to be the paramount feature of the Clyde shipbuilding industry. Other sections of the work of ship construction are almost at a standstill through the backwardness of the rivetting. Negotiations have been proceeding during the whole course of the strike—now over a month old—but while the masters have made concessions, the men are not yet satisfied. Large numbers of them have long since left the district and taken employment on the Tyne and Wear, at rates 10 per cent. under what the Clyde employers are now prepared to concede. As a basis for a settlement of the dispute, the masters offer that the Tyne and Wear price list for rivetting, with 10 per cent. added, and carrying along with it all the accompanying advantages of time-wages during obstructions and removals, &c., and every advantage actually enjoyed under this list by the Tyne and Wear workmen, should be introduced into all the yards involved in the present dispute, instead of the various lists at present existing. In the event of special work, namely, ships of an especially heavy construction, or a particularly fine class, such as the class of ships usually constructed for certain shipping companies referred to, special prices shall be paid. The Tyne and Wear list to be only applicable to what is termed the ordinary class of Clyde-built ships, with 10 per cent. added. It is difficult to forecast

how or when the dispute will end. While the workmen, supported as they are by the Union, and relieved by the employment many have received elsewhere, may be thought to be the stronger combatants; the masters, on the other hand, are mostly exempt from penalty through non-delivery of vessels, and can afford, so far as this is concerned, to bide their time. The inconvenience and loss of employment which the rivetters' strike has already begun to entail upon the other sections of workmen will also tend to support the attitude of the employers.

Few new contracts have been entered into since the writing of last month's notes. Messrs. Napier, Shanks & Bell have received instructions to build for Messrs. Hoddart, Parker & Co., of Melbourne, a saloon paddle-steamer for passenger traffic in Port Phillip. The engines for this vessel, which is to attain a high rate of speed, will be supplied by Messrs. Rankin & Blackmore, of Greenock, and will consist of a set of Rankin's patent and highly successful triple-expansion engines.

For the swift passenger and goods service between Stranraer and Larne, Messrs. William Denny & Bros., Dumbarton, have been instructed to build a magnificent paddle-steamer, to attain a very high rate of speed. This firm it will be remembered recently completed two mail and passenger channel steamers for the Belgian Government, for service between Ostend and Dover, the *Princess Henriette* and *Princess Josephine*, both of which have made remarkably speedy passages and earned renown as swift and comfortable channel steamers. Perhaps on this account the Portpatrick and Wigtonshire Railway Co. have had extra confidence in entrusting the work of producing this their first high-class paddle-steamer of great speed, as the term is understood now-a-days. This vessel is to attain a speed on trial of 19 knots, and she will be fitted throughout in the most luxurious fashion. The engines will be supplied by Messrs. Denny & Co., Dumbarton, on the compound diagonal surface condensing principle of the same type as those of the Belgian steamers above referred to, and work under a mild forced draught.

Messrs. Scott & Co., Greenock, whose greatly enlarged premises now admit of them undertaking a large number of contracts, have been instructed to build and engine two steamers of 1,500 tons each, for Messrs. Swire, London. Having conceded the advance asked, Messrs. Scott & Co. have retained the services of their rivetters while the strike has been going on elsewhere.

Messrs. J. & G. Thomson, Clydebank, have contracted to supply a passenger steamer to the Brazilian Steam Navigation Co., for whom they have already built several vessels. The Brazilian Co., however, gave the last addition to their fleet to Tyne builders. It is pleasing, therefore, to notice their return once again to the Clyde.

The following Clyde firms have sent in tenders for the Government work, which was announced some time ago. Messrs. The Fairfield Shipbuilding and Engineering Co.; Messrs. J. & G. Thomson, Clydebank; Messrs. R. Napier & Sons, Glasgow; Messrs. Scott & Co., Greenock; and Messrs. Caird & Co., Greenock; The Messrs. Scott & Co. will have presently a gunboat on their stocks.

New steel works are about to be established at Renfrew, the promoters and consequent proprietors of the works it is said, being well-known shipbuilders, who intend to manufacture the constructive materials necessary for their shipbuilding business.

At Irvine, Messrs. David Macgill & Co., who chiefly devote themselves to fishing craft, have several steam trawlers on hand. On May 31st they launched a trawler 100 ft. long, one of two similar craft contracted for by Messrs. Muir & Houston, engineers, Glasgow. A third trawler, contracted for by Messrs. Matthew Paul & Co., engineers, Dumbarton, is about to be laid down in the Irvine yard.

The Ailsa Shipbuilding Co., at Troon, are kept completely occupied with, amongst other work, the coasting steamers for the British India Steam Navigation Co., of which six were ordered from this flourishing shipyard. Both here and at Ayr, further down the frith, patent slip docks are established, and the work effected is in both places no inconsiderable part of the firms' businesses. At Ayr, Messrs. S. McKnight & Co., like other Clyde firms, great trouble through the demands and unsteadiness of the ironworkers. On 31st the firm launched a splendid steel steamer of over 1,000 tons for Messrs. I. & A. Wyllie, of Troon. They have a lay down in the vacant berth, and have altogether five vessels on hand.

Kilgoburn, Messrs. John Scott & Co., shipbuilders, are

very fully occupied. They launched on May 30th a fine paddle-steamer named the *Laverock*, 216 ft. in length by 26 ft. beam, for the General Steam Navigation Co., London. They have at present three steamers on the stocks, and three more to begin to.

Symington, the pioneer marine engineer whose work and worth have been so shamefully ignored till now, is at last receiving some small share of that honour to which his memory is due. The committee organised to agitate for a national memorial, ably headed by Mr. Salvyzen, of Grangemouth, are making progress; but apparently they have been unsuccessful in inducing the people of Leadhills—Symington's birthplace, a quaint mining village near the source of the Clyde—to amalgamate their own scheme with that of the more national character.

The Leadhills committee have resolved that the memorial to Symington, the inventor, engineer, and constructor of the first steamboat, should be an obelisk, to be erected on a commanding site in his native village, and have placed the carrying out of their resolution in the hands of Mr. D. W. Stevenson, R.S.A., Edinburgh, who, in addition to a portrait medallion in bold relief of Symington to be placed on the front, will also execute panels in bronze on one side representing the design for a road locomotive made by Symington in 1788, and on the other his first steamboat which, after making a trip to Glasgow in 1801, was set to work and towed on various occasions vessels on the Forth and Clyde Canal, until the proprietors, fearing its banks might be injured by the indulations caused by the paddle wheels, ordered it to be discontinued.

A movement has just been inaugurated in Govan for erecting a statue or other memorial to the late Sir William Pearce, Bart., M.P. At a recent meeting, presided over by Provost Ferguson, and called on a requisition signed by employees in Fairfield Shipbuilding Yard and inhabitants of the burgh, it was resolved that the necessary steps should be taken to erect a suitable memorial in the burgh not only in recognition of his services, philanthropy and generosity, but also in commemoration of the skill and enterprise which he brought to bear on the developments of shipbuilding and marine engineering. Sir William Pearce was the means of enormously increasing the prosperity in Govan, while at the same time he materially shortened the distance between the country and her colonies and possessions, thus assisting to bind together the British Empire, and cementing the friendly relations existing between the American people and ourselves. Influential committees were also formed to collect subscriptions and otherwise further the scheme.

## TRADE NOTES FROM THE TYNE, WEAR, TEES, &c.

**The Tyne.**—The shipbuilding industry is still in the full tide of prosperity, if completely filled building berths, and the maintenance of extraordinary activity in the yards, can be held as evidence of such a satisfactory state of matters. Those who are inclined to the pessimist view, however, point to the fact that enquiries are now comparatively few, as a proof that business men are becoming somewhat doubtful of the future, and that speculative enterprise has, as a necessary consequence, received a check. The fact that on a recent occasion, when a splendidly-appointed Tyneside shipyard, having an area of 7½ acres, was with all its buildings, machinery and appurtenances offered for sale, no bid beyond the reserve price of £10,000 could be obtained, seems to confirm this view, the force of which is certainly not weakened by the consideration that, in spite of losses and withdrawals, the floating tonnage of the world will receive an immense addition as a result of this year's working. The present briskness cannot, of course, be maintained indefinitely, but much may be done in the direction of warding off the evil day of its departure by those most nearly interested, namely, the operative classes. If the different sections of shipyard workmen will keep their demands for wages advances within reasonable limits, and so do their part towards preventing the cost of new tonnage reaching an abnormal height, many shipowners may be induced to invest in new boats, who, under different circumstances, would prefer keeping their old vessels at work, even though such a course might involve the expense of occasional patching up. In these days of fluctuating freights shipowners will not, excepting in very special cases, pay extravagant prices for vessels, and to ensure the continuance of

steady trade it is desirable that all connected with the industry should exercise the virtue of self-restraint in such matters as remuneration and profits. Four of the leading firms on the Tyne have tendered for the building of the new cruisers now about to be given out by the Admiralty. These cruisers—of which there are to be seventeen—will be of the *Medea* type, and will be entirely of steel, with the exception of some half-dozen, which will have, in addition to the steel shell, an outer sheathing of teak. They will be larger than the vessel just mentioned, having a length over all of about 300 ft., and a displacement of 3,400 tons. They will have twin engines of 9,000 I.H.P., and are expected to attain a mean speed of about 20 knots an hour. No doubt is entertained that a good proportion of these cruisers will be built on the Tyne, though of course it is to be expected that a share will go to each of the other districts from which tenders have been sent. These are: Sunderland, Middlesbrough, Liverpool, Barrow, Belfast, Glasgow, and London. The altered conditions under which the work of shipbuilding has had to be carried on since the more general adoption of steel as a constructive material has necessitated in almost all establishments the substitution of new plant for the old machines that did duty in the days when shell plates covered only fire frame spaces, and had to be heated if even a slight curve was required to fit them for the positions they were to occupy. Many firms have been somewhat tardy in carrying out changes called for by the altered circumstances, but they are now apparently becoming alive to the importance of the subject, with the result that the makers of improved machine tools for shipyard work are becoming very busy, and are likely to continue so for some time. A quite unusual pressure of work exists at the four principal yards on the river, namely, Messrs. Armstrong, Mitchell & Co.'s, Elswick and Low Walker Yards; Messrs. Hawthorn, Leslie & Co.'s, and Messrs. Palmer's Jarrow yard. In the repairing establishments there is also very marked briskness to be noticed, many of the vessels that are in hand requiring very extensive alterations or repairs.

**Engineering.**—The Wallsend Slipway and Engineering Co. are just now engaged in engineering the large oil-carrying steamer *Elise Marie*, recently launched by Messrs. Armstrong, Mitchell & Co. for the Tank Steam Shipping Co., Hamburg. Messrs. Hawthorn, Leslie & Co. are also putting engines and boilers in a fine vessel, built to the order of London owners, at their Hebburn yard. It should be stated that the latest trials of the *Marathon* and *Magicienne*, both of which were engined by this firm, have been in every way successful, and the results have given satisfaction to the representatives of the Admiralty. Messrs. R. Stephenson & Co. have three large engines in progress, and arrangements have been initiated by which, it is hoped, the productive capacity will be greatly increased. The managerial position at this well-known engineering establishment, which was made vacant some weeks ago by the death of Mr. Garrett, is now held by Mr. A. Gray, formerly manager for Messrs. Blair & Co., Stockton. This gentleman is both energetic and experienced, and under his directorship the ancient prestige of the establishment is not likely to suffer. Messrs. Ernest Scott & Co., engineers, etc., Close, Newcastle, who only commenced the manufacture of marine engines at a comparatively recent date, are now contemplating a further extensive development of their business, and, with that object in view, have acquired possession of a large piece of ground, with river frontage, in the immediate vicinity of their present works. The preparation of this area for the erection of new buildings is now being actively proceeded with, and in a short time the aspect of the place will be greatly altered. When the extensions about to be entered on are completed, Messrs. Scott & Co.'s establishment will occupy about double its present space, and will be one of the largest engineering concerns in the district. It should be stated that the firm are arranging to add to their business of marine and general engineering the manufacture of electric-lighting apparatus, and contemplate the lighting of steamships, as well as the carrying out of land installations. A new ordnance shop of immense proportions has just been completed at the Elswick factory of Sir W. G. Armstrong, Mitchell & Co., and the machinery, which is of an exceptionally powerful kind, is to be driven by half-a-dozen "Otto" engines of 20 H.P. each. Some very heavy orders for guns and gun-carriages have recently been obtained. A new establishment for the manufacture of engine-room telegraphs and other specialties for steamships has been started in Bath Lane. The proprietor is Mr. Thomas Boydel, who, having for some years occupied a responsible position with one of the leading manufacturers

of steamship telegraphs in the country, may be credited with the possession of the necessary experience in this line of business. The enterprise is certainly started at an opportune moment, and little doubt can be entertained of its success. Messrs. J. H. Holmes & Co., Electric Light Engineers, Newcastle and London, have recently had on their books orders for the installation of the electric light in no less than 20 steamers. This firm makes a speciality of slow speed dynamos coupled directly to vertical engines of the usual marine type, whether single or compound. These take up but little space, and run for long periods with very little attention. The fittings used are specially designed, being strongly made to withstand the shocks to which they may be subjected. With special cables of high insulated power, they have been successfully employed in a number of petroleum boats, in which, during the past few years, they have stood the test of very severe work. Messrs. Holmes have also completed the equipment of several steamers with "projector lights" for use in navigating the Suez Canal, and other lights of a special kind for cruising amongst islands. The firm has just established an agency in Glasgow, under the superintendence of Mr. R. D. Swillie, of 58 West Regent Street. Messrs. John Abbot & Co. have a large amount of work just now in their anchor department, the demand for Tyzack's patent stockless anchor having largely increased of late. Mr. Wasteneys Smith has booked some important orders for his patent anchors during the month, and the manufacturers (Messrs. John Spencer & Sons) are extremely busy.

**The Wear.**—The activity in the shipbuilding industry shows no signs of falling off, and in every instance lately where launches have taken place, keels for other vessels have been put down with the utmost promptitude. Although considerable inconvenience has been caused to some firms through the difficulty of securing punctual delivery of materials, and through the disposition, evinced by some sections of operatives, to lose time unnecessarily, the trade has not for some months past been hampered by wages disputes, and this immunity from a kind of strife which is at all times unpleasant, is at the present moment, when work is plentiful, particularly advantageous to the different interests concerned. Early in the month a most important conference of shipbuilders from the Tyne, Wear, and Clyde, was held at the offices of the secretary to the Sunderland Shipbuilding Association (Mr. John Haswell, Solicitor, 51, John Street), the object being, it was understood, to consider measures by which the builders in each of the districts named, might be able to mutually assist each other, whenever wages conflicts of a more than ordinarily serious nature should arise. It may be assumed that the immediate occasion of the conference was the strike of riveters then existing in connection with several yards on the Clyde; but there is reason to believe that the opportunity was availed of to discuss measures which might be applicable to future emergencies also. The result of the conference has not yet been made known, but the fact of representatives from districts so far apart having been brought together, is looked upon as the first step towards the formation of a closer alliance than has hitherto existed between the shipbuilders of the various centres throughout the United Kingdom. Mr. James Laing, Messrs. W. Doxford & Sons, and Messrs. J. L. Thompson & Sons are among the builders who have tendered for the building of the new Government cruisers, and it is considered certain that one or other of these enterprising firms will secure a portion of the work. Each of them possesses the advantage of having good machinery and plenty of room for the laying down of the largest vessels, and so far as a character for sound and well-finished work is concerned, they are certainly not behind their rivals. At Mr. Laing's yard the great steamer, *Mombasso*, is rapidly being got ready for sea, and another vessel of nearly equal size, and which is ordered by the same company (the British India Steam Navigation Co.), is being framed. It is said that Mr. Laing has orders for four boats in all from the owners of the *Mombasso*, besides some first-class vessels for other important lines. Messrs. W. Doxford & Sons are making arrangements to put down a new set of plate bending rolls that will be capable of rolling plates up to 28 ft. in length, and it is understood that they contemplate putting down a powerful hydraulic machine for bending keel plates, etc., while in a cold state. Messrs. J. L. Thompson & Sons, who, besides having a great pressure of new work in their yard, have a special department for the more effective carrying out of repair contracts, are now engaged in extensively altering the s.s. *Tunis*, belonging to Messrs. Donkin & Nelson, Newcastle, and the engines of which have to be altered from the compound to the quadruple type by

Mr. William Allan. The Strand Shipbuilding Co. are just now laying down a vessel—ordered, it is said, by London owners—which is to be over 300 ft. long, and will be by far the largest vessel yet built in their yard. Messrs. R. Thompson and Sons have put a good many repair contracts through their hands this month, and Messrs. S. P. Austin & Son are just now engaged in a thorough overhaul of the s.s. *Upton*. The steamer *St. Thorwald*, which was launched by this firm on April 30th, has been sold to London owners, and will be employed in the Australian trade. The name of the vessel has been changed to the *Barrier*. Messrs. Short Brothers, who launched a vessel early in the month, and intend launching another before its close, have just commenced the construction of a large steamer for the Prince line. This firm have always exhibited a wise readiness to avail themselves of the advantages conferred by improved machinery, having been among the first in the district to adopt the hydraulic system of rivetting, and being now among the ascending few firms on the North-East Coast that have provided themselves with a machine for punching out "manhole" apertures at one stroke, they have now introduced another labour-saving machine of a very useful and interesting description. It is a machine for counter sinking punched holes, and its main advantage consists in this, that, instead of unwieldy plates having to be moved about, so as to bring each hole to be countersunk under the revolving spindle, the latter is, by a simply-contrived arrangement, readily and easily brought to the required position, thus obviating the necessity for changing the position of the plate. It is expected that 50 per cent. more work will be done by this improved machine than by the machine which is still generally in use, and it certainly greatly lessens the need for physical exertion on the part of the workman who has charge of it. The machine is made to work at an extreme radius of 8 ft. 2 in., and even the longest plates can consequently be countersunk without being moved more than once during the progress of the work, that is to say, when the holes in one half have been completed, the plate has only to be moved sufficiently to allow the machine to work over the remaining half. If two machines are placed in juxtaposition, however, a plate up to almost any length now in use can be countersunk without moving, and this is the arrangement recommended by the makers, Messrs. Hugh Smith & Co., Possil Works, Glasgow. It may here be stated that a machine to answer the same purpose has been manufactured by Messrs. John Lynn & Co., Sunderland, for Messrs. J. L. Thompson & Sons, and is now in operation at the yard of the latter firm. This machine is made to countersink a plate 20 ft. in length by 6 ft. wide, without change of position, and it is constructed much on the same principle as an ordinary travelling crane. It is said to have given unqualified satisfaction in the working.

**Engineering.**—Marine engineers are still having an abundance of orders, but a main difficulty that all firms have to contend with is the impossibility of getting their requirements adequately fulfilled in the supply of castings. Some firms have had to discontinue night working owing to this cause, and one or two of the most enterprising are now seriously contemplating measures to meet the difficulty by manufacturing these articles for themselves. As a case in point, it may be stated that the premises in Monk Street, Monkwearmouth, which were formerly occupied by Messrs. Wilson & Sons, engineers, but which have been standing idle for some years, have been acquired by a couple of local firms, who intend to make the necessary alterations to fit the place for the carrying on of iron and brass founding, on an extensive scale. This, it need scarcely be said, will form an important addition to the industrial resources of the district. Mr. John Dickinson, Palmer's Hill Engine Works, has just ordered from Messrs. Crossley Brothers, Manchester, a 16 H.P. gas engine, and from Messrs. Andrew & Co., Stockport, a 20 H.P. gas engine, both of which are to be utilised for driving the boiler shop machinery. Orders for Dickinson's patent crank shaft are still coming to hand, one of the latest being for a specially heavy shaft to be sent to the s.s. *Kepler*, now lying at Hong Kong. Among other contracts now on hand at the Southwick Engine Works is a set of engines of equal power to those of the s.s. *Nombasa*. Messrs. William Allen & Co. have three adrupe engines in hand for vessels building by rt Brothers. Several other sets are in progress for lining at other local establishments. The smaller s are kept extremely busy, the makers of steam steering gears being particularly well employed. mmouth Ironworks are kept in full and constant

operation, there being a large demand from local shipbuilders for ordinary angle bars, as well as for Bell & Rockliffe's patent specialities. The taper packing manufactured at these works is also having a large and steadily increasing sale.

**The Hartlepoons.**—In shipbuilding the state of business is unaltered, all the firms being still under the necessity of utilising their resources to the fullest extent to keep good their engagements. The Central Marine Engine Works continue to be busily employed, the contracts in hand being both numerous and important. The large new forge buildings have made a further and a very marked advance towards completion, and a second powerful steam hammer has been set to work. Repair work is becoming a very important feature at this establishment, and there are just now some exceptionally heavy contracts of this kind in progress. There are indeed at present no less than ten steamers in this port whose engines are being repaired by the Central Marine Co., and this is by no means an unusual number to be in hand at one time. At the works of Messrs. Richardson & Sons business is as brisk as ever, and two vessels have received their machinery during the month. The greatest activity continues to be noticeable at the steel works, and both cement and rope works are exceedingly busy.

The season of timber importation is now almost at its height, and contractors are finding it somewhat difficult, owing to a scarcity of labour, to get vessels discharged with the necessary promptitude. Labourers at this work are now receiving 5s. 6d. per day, and some who are paid by the piece system are in a position to earn considerably more.

In the sawmills and timber yards business is very active, and on the whole it may be said that this centre never exhibited greater or more general prosperity than at present.

**Stockton.**—The four shipbuilding yards at Stockton, continue busy, and so far as can be observed, no berths are without occupants. In addition to the new work on the stocks, there is some repair in progress, and this of course adds to the general appearance of activity. At Messrs. Blair & Co.'s engine works extraordinary activity is still the feature, and scarcely a week passes without a vessel receiving her machinery. Messrs. Ashmore, Benson, Pease & Co. are very busy in the manufacture of their specialities connected with gas production, and Messrs. Wrightson and Head are showing equal activity in the construction of bridge and girder work, the manufacture of patent railway sleepers, etc. Messrs. Riley Brothers, boilermakers and engineers, are about to proceed with the erection of their new premises, which are very pressingly needed just now, seeing that the firm are unable to add to the number of orders on their books, unless in cases where the stipulated date for delivery is a very long way ahead. In both the boiler making and shipbuilding trades there is a marked scarcity of skilled operatives, and some firms at this centre have for some time past been advertising for hands. The local iron and steel works keep briskly employed.

**Middlesbro'.**—Messrs. Westgarth, English & Co., marine and general engineers, are exceedingly busy, and working night and day in all departments. We understand that they have lately booked several important orders, and are at present engaged almost entirely on marine work. During the past month they have fitted out in Middlesbro' Dock three vessels, for which they have supplied the whole of the machinery. Two of the vessels were built by Messrs. Craggs & Sons, of Middlesbro', and one by Messrs. Craig, Taylor & Co., of Stockton. Messrs. Westgarth, English & Co. have their engines in hand for both these firms, and also for Messrs. Raylton Dixon & Co., of Middlesbro', and Messrs. Irvine & Sons, of West Hartlepool. The other engineering establishments at this centre are fairly well employed, and foundries are having a full supply of work. The four shipbuilding and ship repairing establishments are, like those at all the other seats of the industry, showing a very prosperous state of business. Messrs. Raylton, Dixon & Co.'s yards being the busiest as well as the most important. This well-known firm is, it may be stated, among the list of builders who have tendered for the building of some of the new cruisers that are to be added to the Fleet for purposes of national defence. The Tees Conservancy Commissioners' monthly returns, which were issued on June 18th, show a marked improvement in the shipping trade of the river. The income derived from dues, etc., shows a net increase for the past month of £381 17s. 4d. The actual revenue for the two ports of Stockton and Middlesbro', for the seven months ending with May, was £38,156 6s. 7d., and the amount of tonnage 1,160,523 tons, or a total increase, as compared with the preceding seven months, of 35,313 tons.

The number of vessels entering the ports during the seven months was 3,352, which was an increase of 158 as compared with the period indicated.

**Darlington.**—At the Darlington Forge Co.'s works, inquiries for iron and steel forgings and steel castings continue to be plentiful, and the activity in all departments is well sustained. Within the past few days some important additions have been made to the contracts on hand. Among these may be mentioned an order for two cast steel stern frames to weigh 12 tons each from one of the leading shipbuilding firms on the Tyne, and an order for a cast steel stern frame, to weigh 10 tons from a Sunderland firm. At the moment things seem a little quieter—that is to say, there is a little less pressure in regard to prospective orders—and this quieter tone is likely to be noticeable until after the Newcastle Race week (terminating June 29th), which always exercises a deterrent effect upon business. The Darlington Waggon Works continue well employed, and other factories in the district are doing a steady trade.

**Consett.**—The Consett Iron and Steel Co. are flooded with orders, and the resources of their great works are pretty severely taxed to meet the increasing requirements of customers. The weekly output far exceeds all former records.

### THE MERSEY.

At the forty-eighth annual meeting of the shareholders of the Pacific Steam Navigation Co., it was stated that the steamers of the company had run 1,306,000 miles in the past year against 1,226,000 in 1887, the increased coal bill for the extra mileage being, however, £80,000. The profit on the working account was £186,341, the profit and loss account, after deducting £141,561 for depreciation, new boilers, etc., shows a credit balance of £43,241; which, added to £11,658 brought forward, and an appropriation of £25,000 from the underwriting account, enabled the directors to declare an additional dividend of 18s. per share, extra to that of 12s. per share paid last November. The net balance carried forward to 1889 is £6,222. The underwriting account shows a profit of £41,000, and after transferring £25,000 from this to profit and loss account, a balance of £167,529 is carried forward to 1889. The company are having four new steamers constructed by the Naval Construction and Armaments Co., of Barrow, and one of these, the *Oruba*, has just been delivered. Unfortunately the seamen's agitation for an increase of wages has assumed a very awkward aspect, and at present things look very black indeed, the National Seamen and Firemen's Union, which only a few months ago was hardly known, having now developed into a powerful factor with 60,000 members at its back. We hope to be able, later on in the month, to send better reports, but at present the various shipping companies are determined to oppose the demand for an increase of pay.

In the timber trade heavy imports and a satisfactory consumption are to be reported, and as there is every confidence in the market and a tendency for prices to remain firm, no one complains.

The visit of the American engineers to this country commenced with the landing of the first and second contingents from the *City of Richmond* and the *City of New York* respectively. The members of council of the Liverpool Engineering Society and many local engineers boarded the vessels in the river and offered the visitors a hearty welcome. Owing to Whitsuntide there was but little doing in the various works during the middle of the month, and the town wore quite a holiday look. On Whit-Monday the Woodside Ferry traffic amounted to 52,163 being 6,500 less than last year.

Over 40,000 went to Eastham, the attraction being the Manchester Ship Canal Works, while New Brighton, Egremont and Seacombe received a total of 106,272 visitors.

In the live stock and dead meat imports the month shows an increase in cattle, sheep, and quarters of beef, and trade in this direction is quite up to the average.

The Vyrnwy Water Works are making most satisfactory progress. The construction of the cast-iron tunnel under the Mersey to receive the mains caused a great deal of difficulty owing to the treacherous nature of the strata through which a portion of it passes, this, however, we are glad to say, has been successfully overcome, and the work is now making rapid headway.

The sailors' strike still continues to inflict losses on all concerned, and so far there are no signs whatever of either side giving way, if anything the masters are more than ever determined to withstand the demands of the men. The Board of Trade talked about acting as mediators, but they are looked upon, so far, by both sides more in the light of interlopers than as benefactors. The scalers have now joined those on strike, and it is evident that we have not seen the last of the movement yet.

### WELSH NOTES.

THE interest of shipping men and freighters just now is absorbed in the preparations being made for the approaching opening of the Barry Docks. They are situated some miles nearer the entrance to the Bristol Channel than Cardiff, and are, by means of newly-laid railways, brought into quite as close connection with the Rhondda Valley coal field. The docks are considered the most perfect in the world, and certainly no expense has been spared to make them so. Coal will be the principal article of shipment, but the directors have looked a long way ahead, and provided all the necessary facilities for fostering that import trade which none of the Channel ports but Bristol has yet got any appreciable share of. For the construction of these works, Parliamentary sanction was obtained about five years ago after a battle almost as great as that which resulted in the triumph of the promoters of the Manchester Canal Scheme. For very many years nautical men had regarded the Barry Island as a very suitable site for docks; but no active steps were taken in the matter, till the leading Cardiff freighters, annoyed at the difficulties experienced in getting steamers at the Bute Docks, decided to break down the monopoly. Accordingly, headed by Mr. David Davis, of Ocean Collieries, who guaranteed £100,000 towards the preliminary expenses, a number of freighters banded themselves together, and went to Parliament for permission to construct the Barry Dock. Then it was that the Marquis of Bute thought it time to provide greater facilities at Cardiff, and the result was the fine new dock which was opened between two and three years ago. But this step was taken too late in the day. The freighters had put their hand to the plough, and they declined to withdraw. They were beaten at first, but they were not disheartened, and on the next attempt they scored a complete triumph. The railways which are to connect the docks with the coal fields has been completed for some time, and now Mr. Walker, the eminent contractor, has so nearly finished his work, that the opening ceremony is announced to take place on the 18th of July, when Lady Windsor will open the lock gate, and a vessel belonging to one of the shipowners connected with the company, will steam in and break a silken cord fastened across the entrance. After this ceremony, a luncheon will be given. The success of these new docks is understood to be assured, for the promoters of the company are said to have guaranteed the shipment of at least 3,000,000 tons of coal a year therefrom. That public confidence in the undertaking is great is evident from the fact that at the moment of writing—nearly a month before the day of opening—the £10 stock is quoted at 14½ to 15½, and the preferential shares at £3 above par. How far the opening of Barry Docks will affect the other docks in the Channel is a question which is causing some concern in certain circles.

It is to be feared that South Wales is in some danger of being over dockized. Almost simultaneously with the completion of the Barry Dock comes Parliamentary sanction to a scheme for amalgamating the Bute Docks Company with the Taff Vale Railway Company; and this is no sooner known than there comes the announcement that the Rhymney Railway Company, which fears that its interests may be to some extent affected by the amalgamation, has decided to seek during the next Parliamentary session powers to construct a large import and export dock at the mouth of the river Rumney. The reason alleged is that "the directors of the Rhymney Railway Company felt that, however stringent the provisions that may be introduced into the Bute-Taff Amalgamation Bill for their protection, they must of necessity suffer through the absolute control of the docks into which they employ their traffic being in the hands of a rival company. Consequently they decided that the only course open to them in order to foster and develop their own business was to possess a dock of their own, and thus be enabled to regulate their traffic and arrange a tariff which would be an inducement to shippers to use their conveniences."

The site said to be selected is described as a most suitable one. A few days after the publication of the details of this scheme, Mr. John Boyle, the chairman of the Rhymney Company, wrote to the *South Wales Daily News* saying, "No decision of the kind was taken," whereupon the editor draws attention to the fact that Mr. Boyle does not deny that the question has been considered.

Another important function for the near future is the opening of the Rhondda and Swansea Bay Railway. Its object is to connect the Rhondda with Swansea, and it is claimed that by its means Swansea will be brought even closer to the coal-field than Cardiff. This will be a great advantage when Swansea's geographical position at the entrance of the Bristol Channel is borne in mind. The reason this line took so long in construction was the difficulty of getting the capital. It is now, however, almost ready, and should be opened in a couple of months. An extraordinary feature in the construction of this railway is that during almost the whole time it has been in hand the sections completed have earned a small dividend. Now the shares are quoted  $1\frac{1}{2}$  above par.

A question of great importance is the revision by the colliers of South Wales of the sliding scale. The men have gone to work with a will on the question, and the result is a scale which will probably be considered fair all round. The feature of the revision is a stipulation that the president shall be admitted to the meetings of the sliding scale committee. Another, that weekly pays are demanded.

Colliery proprietors are again looking forward to an increase in the price of coal. As to the superiority of Welsh coal for bunker purposes, there is much jubilation in Wales over the high character given to it by the First Lord of the Admiralty. A north-country engineer claims that by the use of proper appliances north-country coal can be rendered equally smokeless and efficient as the Welsh coal; and he urges north-country coal owners to prove this to the world by adopting the requisite appliances at their own works and in their own steamers. The strange thing is that, while north-country people are always cracking up their coal, they use as little of it as possible in their own steamers. It seems to be forgotten that the appliances which improve north-country coal also improve Welsh coal in an equal degree. At the price much of the Welsh bunker coal is sold, it is needless to say, some supplied is not the best, and is not smokeless.

The week ending the 22nd of June is the best ever known at Swansea, where nearly each month seems, year after year, to be better than the preceding one. It is also pleasing to find that there is a revival of trade at Newport.

The House of Commons Committee has sanctioned the abolition of the town dues levied on imports at Swansea. Should the Lords confirm this decision, the coasting trade of the port should largely increase. The abolition of the bridge tolls, sanctioned by the same authority, will also tend to greatly encourage industry. At the same time consent has been given to a scheme for constructing a railway to the Mumbles, and the erection of a pier at the extremity at which ocean steamers can land passengers. If this scheme is ever realised, it is thought a great step will be taken towards getting some of Liverpool's passenger and mail trade with America.

The tinsplate makers are taking an example from their men. The men a year ago formed a union, and a couple of months since they tried their strength on one of the principal makers. After a desperate struggle, they succeeded in bringing him to their terms. This set the makers a-thinking. If the men were strong enough to beat one of the biggest employers, how might the smaller ones fare? So they have decided to revive an association which was allowed to go into abeyance years ago, with the object of combining to protect themselves against the men.

Steps are being taken at Swansea to encourage the development of a petroleum trade with America, and with this view special rates are to be made.

The appointment of Mr. Jarrett to the position of American Consul at Birmingham is not viewed with equanimity by South Wales tinsplate makers. It is thought that the reason he has been stationed at the capital of the Midlands is his knowledge of the iron and tinsplate trades, and the facilities he would, therefore, have of supplying important information to his competitors of these industries, and especially of the tinsplate makers. These Americans are trying their utmost to manufacture tinplate. The result is that some tinsplate makers have been so much on their minds not to admit strangers to their works. Mr. Jarrett, M.P., has been on a visit to Swansea, pre-

sumably with the object of procuring evidence as to the number of overlaid ships which leave Welsh ports.

The telegraph has at last been extended to Gower—a peninsula at the entrance of the Bristol Channel on the Welsh side where so many wrecks occur. So far, however, the wire only goes so far as Reynoldstone. This is a move in the right direction, looked at from a shipping point of view; but the line should be continued to the Worms Head, where a signal station ought to be erected. Up to now, lack of telegraphic facilities between Swansea and the Gower coast has been much felt when steamers have gone ashore. The local members should not be satisfied till they have won the concession from the legislature, and hon. members generally should not rest till there is a complete girdle of telegraph wire round the coasts.

## BELFAST TRADE NOTES.

THE White Star liner *Teutonic*, is now ready for sea. It will be remembered that she was the first vessel to enter the Alexandra Dock, which was declared open by Prince Albert Victor on May 22nd.

The builders here are well stocked with orders in advance, and the greatest activity prevails in all departments; the great drawback now to the rapid execution of work being the unsteadiness of the men themselves, who unfortunately seldom think of turning up until the Wednesday following pay day, and in fact there is often a difficulty to get sufficient men together to keep the yards going.

The coal merchants are suffering by the repeated strikes of the labourers; shipowners are taking advantage of the dispute by laying up their vessels for a thorough overhaul.

The ironworkers in all the shipbuilding yards have given notice for an advance of 10 per cent. on piecework rates, and 15 per cent. on time wages, with a request for the return to the weekly pays.

Messrs. McIlwaine & McColl's fitters went on strike in the middle of the month because non-society men were brought in as iron turners, and as the firm have a great deal of work on hand, and a large steamer for a Greek firm almost completed, great inconvenience was caused by this action on the men's part. Great activity prevails in the linen trade, and happily prosperity, so far as trade is concerned, seems to be the order of the day.

We are glad to say that the masters appear disposed to deal liberally with the demands of the ironworkers for an advance, and hence there is no likelihood of a split occurring on that score.

## LEITH NOTES.

THE general trade of Leith has been almost at a standstill for the first half of June, owing to the seamen's strike; neither owners nor seamen seem inclined to give way, and the result will most likely prove fatal to the seamen, as all the steamers are being manned by foreigners or fishermen. Messrs. James Currie & Co. have their steamer *North Star* lying in the roads as a floating home for the men they have brought over. The small wooden steamer *Colonist*, engaged by Messrs. Hawthorns & Co. for Messrs. Messina Brothers, of Port Elizabeth, sailed from Leith for the former port on the 13th inst. It is proposed to hold an exhibition of Electrical Engineering and Mechanical Inventions in Edinburgh next summer. A deputation of those connected with engineering in Edinburgh, waited on the Town Council on the 18th inst. When Mr. George E. Watson, interim secretary, stated that a sum of £50,000 would be required for carrying out the project, but that a great deal of support had been promised already. The Lord Provost assured the deputation that the proposal would receive the council's best consideration. As the Forth Bridge will be completed and opened for traffic by that time, a large number of visitors are expected in Edinburgh next year, which renders the financial success of the exhibition certain.

THE FAST CRUISER "HAWKE."—The Admiralty have issued orders for the construction of a fast cruiser of the first-class, to be named the *Hawke*. The *Hawke* has been designed under the supervision of Mr. W. H. White, Director of Naval Construction, and will, in a great measure resemble the new fast cruisers *Blake* and *Blenheim*.

**Alarich.**—On May 30th Messrs. W. Gray & Co., Limited, launched a screw steamer, built of Siemens-Martin steel, to the order of Herr Johannes Lange, of Kiel, Germany, and of the following dimensions, viz:—Length over all, 265 ft.; breadth, 35 ft.; and depth 21 ft. 11 in. This vessel will take Lloyd's highest class, and is of the awning-decked type with saloon and cabins for captain, officers, etc., aft, crew's berths forward, and engineer's accommodation in deck houses amidships. The hull is built on the web-frame principle, large hatchways are fitted, four steam winches, hand and steam steering gear amidships, and screw gear aft, Emerson, Walker & Co.'s direct steam windlass, donkey boiler, and cellular double bottom for water ballast. Pole masts with fore and aft rig, boats on beams overhead, and everything complete will be provided for general

trading. Fine triple-expansion engines and two steel boilers are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. She was gracefully christened *Alarich* by Mrs. M. Gray, of Greatham. It may be added that the *Alarich* is sister ship to the *Theodorich* recently launched by Messrs. W. Gray & Co., Limited, for Herr Johannes Lange, on whose behalf Messrs. Menzie & Blagburn have superintended the building.

**Ethelreda.**—On May 30th a new steamer, built of steel, was launched from their shipbuilding yard at Hull a fine steam trawler, built to the order of the Humber Steam Trawling Company. The christening ceremony was performed by Mrs. Charles Judge, who named the vessel the *Excelsior*. She is a sister ship to the *Nil Desperandum*, which Sir Albert Rollit launched at the same yard. After the vessel entered the water she was taken into Messrs. Bailey and Leatham's yard, to be fitted with her engines, which are of the same style as fitted in the *Philip Marsted*, just sent to sea. The *Excelsior* is 100 ft. long, 26.9 ft. broad, and 11 ft. deep.

**Excelsior.**—On June 1st Messrs. Cook, Welton & Gemmell launched from their shipbuilding yard at Hull a fine steam trawler, built to the order of the Humber Steam Trawling Company. The christening ceremony was performed by Mrs. Charles Judge, who named the vessel the *Excelsior*. She is a sister ship to the *Nil Desperandum*, which Sir Albert Rollit launched at the same yard. After the vessel entered the water she was taken into Messrs. Bailey and Leatham's yard, to be fitted with her engines, which are of the same style as fitted in the *Philip Marsted*, just sent to sea. The *Excelsior* is 100 ft. long, 26.9 ft. broad, and 11 ft. deep.

**Newquay.**—On June 1st Messrs. C. S. Swan & Hunter launched from their yard at Wallsend-on-Tyne a steel screw steamer of the following dimensions:—Length, 280 b.p. by 37 ft. 6 in. by 21 ft. 8 in. depth moulded, designed to carry about 3,200 tons deadweight, and built to the order of Messrs. J. J. and C. M. Forster, of Newcastle. This vessel is built to Lloyd's highest class, and has all the modern improvements, including web frames and longitudinal stringers, instead of hold beams, large hatchways, engine and boiler casings carried 6 ft. 6 in. high, full poop aft, long raised quarter-deck, long bridge-house carried forward of foremast, and open topgallant forecable. There are five watertight bulkheads, water ballast tanks in a cellular double bottom, all fore-and-aft, also in a large after peak tank; four steam winches, large patent vertical donkey boiler, and steam windlass. The engines, by Messrs. Black, Hawthorn & Co., are capable of indicating 1,250 H.P. This vessel was launched immediately after the *Santon* (s.), and was named the *Newquay* by Mrs. J. J. Forster.

**Santon.**—On June 1st Messrs. C. S. Swan & Hunter launched from their shipbuilding yard at Wallsend-on-Tyne a steel screw steamer, built to the order of Messrs. Huddart, Parker & Co., of Melbourne. The vessel is 304 ft. b.p., by 39 ft., by 23 ft. 2 in. depth, moulded, built to Lloyd's highest class, and is intended to carry about 3,850 tons. She is fitted with all the latest improvements for loading and discharging cargo, including four steam winches, two steam coal whips, and large horizontal donkey boiler. There are five steel bulkheads and web frames, full poop fitted for captain and officers, long raised quarter-deck, long bridge carried forward of foremast, with engineer's quarters at after end, topgallant forecable fitted for crew and petty officers, and provision for water ballast in a cellular double bottom, fitted all fore-and-aft, and also in a large after peak tank. The engines, by the Wallsend Slipway and Engineering Co., of Wallsend, are capable of indicating 1,400 H.P., and the boilers are fitted with fans for forced draught on the closed ash-pit system. As the vessel left the ways, she was named the *Santon* by Mrs. G. B. Hunter.

**William Osten.**—On June 3rd there was launched from the yard of Messrs. W. Hepple & Co., a splendidly modelled iron screw line boat, of the following dimensions:—Length between perpendiculars, 100 ft.; breadth, 18 ft.; depth, 10 ft. This vessel, which has been built for W. Osten & Co., North Shields, will have engines of 40 N.H.P., compound surface condensing, which will be fitted by Messrs. Baird & Barnsley, of Bull Ring Engine Works. She is intended for the line fishing, and is fitted with a large tank, through which the sea water flows continually. As the vessel left the ways she was named the *William Osten*.

**Ironopolis.**—On Monday evening, June 3rd, there was launched from the yard of Messrs. Raylton Dixon & Co., a fine steel screw steamer, which has been built to the order of Messrs. J. M. Lennard & Sons, of Middlesbrough. She is of

the following dimensions:—Length over all, 305 ft. 3 in.; breadth, 38 ft.; depth moulded, 22 ft. 10 in., with a deadweight carrying capacity of over 3,700 tons. The vessel is built with raised quarter-deck and with bridge and forecable in one, forming an awning deck, short hood aft, water ballast, and otherwise fitted as a first-class cargo steamer. Her engines, which are being built by Messrs. Blair & Co., of Stockton, will be fitted with cylinders 22½ in., 36½ in., and 60 in. by 39 in. stroke. On leaving the ways she was gracefully christened *Ironopolis* by Mrs. William Lennard, of The Outlands, Middlesbrough. A large party of ladies and gentlemen who were present at the launch were afterwards entertained by Mr. J. Morratt Lennard to dinner at the Erinuis Club. Amongst those present were Mr. and Mrs. J. Morratt Lennard, Mr. and Mrs. John Milner Lennard, Mr. and Mrs. Arthur Lennard, Mr. and Mrs. William Lennard, the Mayor and Mayoress of Middlesbrough, Mr. and Mrs. Raylton Dixon, Rev. Canon Wright, Rev. and Mrs. Pudsey, Mr. H. Cochrane, Mr. Belk, Mr. Fawcett, etc.

**Prudentia.**—On June 4th the steamship *Prudentia*, built by Palmer's Shipbuilding Co., to the order of Mr. Alfred Suart, of London, was launched from their Jarrow yard. She is 312 ft. long, 40 ft. beam, and 21 ft. 3 in. deep, and is intended for the carriage of petroleum in bulk. The vessel is from the designs of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, and has been built under their inspection. She is divided by bulkheads into six compartments for oil, having a capacity of 3,200 tons, with a special tank for use during the summer months, when the freeboard is less and more cargo can be carried. She has bunkers for 500 tons of coals, and is arranged and ventilated for either crude or refined oil, or part cargo of both, and designed for discharge at ports with a limited draught of water. She will be fitted with powerful pumps and the electric light by Messrs. Hayward, Tyler & Co. Her machinery by the builders will have cylinders 24 in. by 38 in. by 62 in. diameter, by 42 in. stroke, and will be supplied with steam from two large boilers with about 4,500 square feet of heating surface.

**Thomas Anderson.**—On June 11th Messrs. Short Brothers launched from their shipbuilding yard at Pallion a handsomely modelled steel screw steamer, built to the order of Messrs. Anderson, Horan & Co., of Sunderland, of the following dimensions:—Length, 292 ft.; breadth, 40 ft.; and depth of hold, 27 ft. 6 in. to ordinary floor. The vessel is constructed of steel to the highest class for spar-decked steamers in Lloyd's Registry under special survey. The cabin accommodation is under the spar deck at after end, with commodious saloon, handsomely fitted up in polished hardwood, the officers' and engineers' accommodation being fitted up in the long bridge house amidships, which covers the engine and boiler space, while the crew are berthed in a spacious topgallant forecable. The vessel is divided by six watertight bulkheads; she is also fitted with four very large hatchways, with steam winch at each, the steam for the latter being supplied by a large multitubular donkey boiler, placed on spar deck; direct-acting steam windlass, steam steering gear, and all the latest improvements for economy and despatch. On leaving the ways the vessel was named *Thomas Anderson* by Mrs. J. Y. Short. The vessel is to be fitted with engines of 200 H.P., by Mr. John Dickinson, of Sunderland, on the triple-expansion principle, with two large steel boilers, having a working pressure of 150 lbs. per square inch, together with all recent improvements for economy and efficiency.

**Geiserich.**—On June 12th, Messrs. W. Gray & Co., Limited, launched the screw steamer *Geiserich*, sister ship to the *Alarich* and *Theodorich*, which were recently launched for the same owners, Herr Johannes Lange, of Kiel, Germany. The dimensions of the steamer being:—Length, 255 ft.; breadth, 35 ft., and depth, 21 ft. 11 in. She will take Lloyd's highest class, and is of the awning-deck type with saloon and cabins for captain, officers, etc., aft, crew's berths forward, and engineers' accommodation amidships. The hull is built on the web-frame principle, large hatchways are fitted, four steam winches, hand and steam steering gear amidships and screw gear aft, Emerson, Walker & Co.'s direct steam windlass, donkey boiler and cellular double bottom under each hold for water ballast. Pole masts with fore-and-aft rig, boats on beams overhead, and everything complete will be provided for general trading. Fine triple-expansion engines and two steel boilers are being supplied by the Central Engine Works of Messrs. W. Gray & Co., Limited. Messrs. Menzie & Co., Newcastle-on-Tyne, have superintended the ship and machinery on behalf of the owners.

**Rheinfels.**—On Thursday afternoon, June 13th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, the fourth steamer built by that firm for the Hansa Steamship Co., of Bremen. The length of the vessel is 322 ft.; breadth, 41 ft.; and depth of hold, 27 ft. 6 in. The steamer is built to the spar deck rule and has large topgallant forecastle to accommodate crew, firemen, and long bridge amidships, in which is placed the saloon and accommodation for captain, officers, and a few first-class passengers. The vessel is constructed upon the web-frame principle, thus dispensing with hold beams, and has cellular water ballast all fore and aft; all weather decks are of wood and all frames of Z steel. Her class will be 100 A 1, Lloyd's special survey, and also the highest class in the German Registry. The deck machinery consists of five large steam winches fitted with helicon gear, Harrison's steam steering gear, which is placed in the engine-room and worked from the bridge, Harfield's patent direct steam windlass, Tyzack's patent anchors, and all the usual appliances for hauling cargo and working the ship with the greatest possible despatch. The marine engines are upon the tri-compound principle, by the North Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 23½ in., 39 in., and 64 in. by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel during construction has been inspected on behalf of the owners by Mr. Wulff and Mr. Himer, and upon leaving the ways was gracefully named *Rheinfels* by Miss Himer, after which she was towed into the South Dock to receive her machinery.

**Trafalgar.**—On June 13th there was launched from Messrs. John Blumer & Co.'s yard, North Dock, Sunderland, the steel screw steamer *Trafalgar*, built to the order of Messrs. Pinkney, Sons & Clare, of London. She will carry about 2,400 tons deadweight, and is of the following dimensions, viz.:—250 ft. by 36 ft. by 18 ft. 3 in., and is of the well-deck type, with long bridge to foremast. She has been built more especially for the Danube, Azov, and Baltic trades, and will have all the latest improvements. The vessel was named by Mrs. D. G. Pinkney, jun., of Enfield, London, and after the launch was towed into the North Dock, whence she will proceed to Leith in a few days to be fitted with triple-expansion engines by Messrs. Alley and McLellan, of Glasgow, with cylinders of 18 in., 30 in., and 48 in., and boilers by the same firm, working at 160 lbs. pressure.

**Illyd.**—On June 13th a new screw steamer, built to the special order of the firm of Messrs. Turnbull Brothers, of Cardiff, was launched from the premises of Messrs. Thomas Turnbull & Son, Whitehall Shipbuilding Yard, Whitby. The vessel was named the *Illyd*, by Mrs. Lewis R. Turnbull, the wife of one of the owners. The vessel will be commanded by Captain George Stainthorpe, late of the *Bernard*. The *Illyd* is a graceful looking craft, and seemingly well adapted for the trade in which she is to be employed. The following are the dimensions and other particulars of the new vessel:—Length over all, 268 ft. 9 in.; length between perpendiculars, 258 ft.; breadth, 37 ft.; depth to top of cellular floor plate, 16 ft. 11 in.; class 100 A 1 at Lloyd's; deadweight capacity, about 2,550 tons at 18 ft.; bridge, 112 ft., with lodgings for officers and crew under it; raised quarter-deck, 60 ft. long; poop aft, 28 ft. in length; six watertight bulkheads of steel; Emerson & Walker's patent windlass; four steam winches, two of 6-in. and two of 7-in. cylinders; Rodgers' steam steering gear aft; companions and skylights of iron; schooner rig; engines by Blair & Co., direct-acting triple-expansive; diameter of cylinders, 20 in., 33 in., and 54 in.; stroke 36 in.; N.H.P., 140; two cylindrical tubular boilers of steel, with Fox's patent corrugated furnaces; working pressure 160 lbs.

**Chapstow.**—On June 13th there was launched from the shipbuilding yard of Messrs. Edward Finch & Co. a screw tug built to the order of the Barry Dock & Railway Co. She will be fitted by the builders with pumps that will make her one of the most powerful salvage steamers afloat.

**Haldon.**—On Saturday, June 15th, Messrs. Edward Withy & Co., West Hartlepool, launched from their yard at Hartlepool a fine steel screw steamer, built to the order of Messrs. John Holman & Sons, London. The vessel is over 260 ft. in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity and built to the highest class at Lloyd's. She has a long raised quarter-deck, long bridge-bow and topgallant forecastle. The holds are fitted with iron grain divisions and cargo battens; all decks, deck erections,

skylights, bulwarks, bulkheads, etc., are constructed of steel. In the main and after holds the vessel is constructed on the web-frame system, which gives a very strong type of ship, and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. Her cellular bottom is fitted all fore and aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey boilers, hand and steam steering gear amidships, screw gear aft, patent windlass on forecastle, patent stockless anchors hauling up into hawse pipes, and other modern appliances will be fitted for the handy working of the vessel. The ship will be rigged as a two-masted fore-and-aft schooner, with steel pole-masts, derricks, and other cargo appliances for expeditious hauling of cargo. The saloon and cabin for the accommodation of passengers, captain and officers, is handsomely finished in polished hardwood, with neatly painted panels executed in a very effective style by the decorative staff of ladies employed by the firm. Triple-expansion engines will be fitted by Messrs. Blair & Co., Stockton-on-Tees. On leaving the ways the vessel was gracefully christened *Haldon* by Miss Emily Vick, daughter of one of the builders.

**Skarpano.**—On June 15th there was launched from the yard of Messrs. Wood, Skinner & Co., Bill Quay, a steel screw steamer built to the order of Messrs. Fearnley & Eger, of Christiania. The principal dimensions are:—Length, 281 ft. 8 in.; breadth, 37 ft.; depth, moulded, 20 ft., with a deadweight carrying capacity of 3,000 tons. She is constructed on the cellular-bottom principle, and, as well as taking the highest class at Lloyd's, will also take the highest class in Norwegian Veritas, \*1A1, having been built under the special inspection of Mr. Lauritz, M. Bodin of London, principal surveyor to the Norwegian Veritas. The vessel during her construction has also been superintended by the inspector of the owners, Captain L. B. Foss. The engines have been built to Lloyd's and Norwegian Veritas requirements by the North Eastern Marine Engineering Co., Limited, Wallsend. They are on the triple-expansion system, having cylinders 21 in., 35 in., and 58 in. by 39 in. stroke, and are capable of indicating 1,000 H.P. The vessel, which was named the *Skarpano*, has been specially adapted for the Black Sea, Baltic and India trades, and is fitted with all modern appliances for efficient and economical working. The christening ceremony was gracefully performed by Mrs. Foss, wife of Captain Foss, as the vessel left the ways. This is the second vessel built for the same owners, and Messrs. Wood, Skinner & Co. have another vessel to put down on the same berth.

**Aislaby.**—On June 15th Messrs. Ropner & Son launched a steel screw steamer of the following dimensions:—Length over all, 324 ft.; breadth, 40 ft. 6 in.; depth, moulded, 23 ft. 7 in. This steamer has been built under special survey to class 100 A 1 at Lloyd's, and will carry 4,350 tons deadweight on Lloyd's summer freeboard. She has a short full poop, in which is fitted accommodation for captain and officers, raised quarter-deck, long bridge extending to foremast, short well, and topgallant forecastle, with cellular bottom for water ballast. She is built on the web-frame principle, and will have all the latest improvements for a first-class cargo steamer. Her engines are by Messrs. Blair & Co., Limited, on their improved triple-expansion principle, of 250 H.P.N., with two large steel boilers working at 160 lbs. The steamer has been built to the order of Messrs. R. Ropner & Co., of West Hartlepool, and as she left the ways was named *Aislaby* by Mrs. Ropner, of Preston Hall, Stockton-on-Tees.

**Crimea.**—On June 15th a valuable addition was made to the fleet of steamers managed by Messrs. Stephen Mawson & Goss, of Newport (Mon.), when the Blyth Shipbuilding Co., Limited, launched from their works at Blyth a fine specimen of a modern cargo steamer for the above-named firm. The principal dimensions of this vessel, which is built to Lloyd's highest class, are as follows:—Length, 260 ft.; breadth, 36 ft. 6 in.; and depth, 19 ft. 4 in. She has been built entirely of iron, and is on the cellular double-bottom principle for water ballast, with web frames, etc. Her deck arrangements consist of a long raised quarter-deck, with poop, and a long bridge extending from after end of engine room to the fore side of foremast. The accommodation for master and officers is in a neat cabin aft, below the poop deck, while the engineers are provided with suitable accommodation at after end of bridge, the sailors' and firemen's berths being in topgallant forecastle. The vessel has been built

to comply with the Board of Trade requirements for carrying grain in bulk. There are four large cargo hatches for the rapid loading of cargo, with four powerful steam winches by Messrs. J. Smith & Son, of Newcastle-on-Tyne. Harfield's patent windlass is placed on forecastle deck, and Messrs. Donkin & Nichol's steam and hand-steering gear is fitted in a wheelhouse on bridge, and connected to circular tiller aft. The engines are of the triple-expansion type, and will be supplied by Messrs. Black, Hawthorn & Co., Gateshead-on-Tyne, with cylinders 20 in., 34 in., and 54 in., by 36 in. stroke, and 160 lbs. pressure. As the vessel left the ways she was named the *Crimea* by Miss Lizzie Stephens, of Newcastle-on-Tyne.

**Parahyba.**—On June 15th this vessel was successfully launched from the yard of Messrs. Wm. Doxford & Sons, at Pallion. She has been built to the order of Messrs. D. G. Pinkney & Sons, Sunderland, but has since been sold to the Compagnie des Chargeurs Réunis of Paris, is entirely of steel, and built to Lloyd's 100 A 1 class. The principal dimensions are:—Length, between perps., 310 ft.; breadth, extreme, 38 ft. 6 in.; depth from ordinary floor to spar deck, 26 ft. 3 in.; with cellular bottom fore and aft. The engines are quadruple-expansion, by Messrs. W. Allan & Co., of Sunderland, with all the latest improvements, the cylinders being 15½ in., 20 in., 31 in., and 54 in. by 42 in. stroke, and they are supplied with high pressure steam from very large boilers. She is fitted in the most approved manner for a large number of emigrants, and has Bow, McLachlan's patent steam steering gear, and Hastie's screw gear aft. She has 4 ft. 6 in. by 10 in. steam winches, by Messrs. Helford Bros., of Pallion, with the latest improvements for cargo purposes. The cabins are beautifully got up in hardwood, aft, and give most comfortable quarters for captain, officers, and engineers amidships, the crew and firemen being comfortably berthed in the forecastle. The christening ceremony was gracefully performed by Mrs. Tom Pinkney, of Sunderland.

**May Flower.**—On June 15th Messrs. George Brown, Son & Co., Hull, launched a new model screw-steamer, to the order of Mr. F. Palmer, of Boston. The vessel was named the *May Flower* by Miss Ada Brown, daughter of the builder. This is the fifth vessel built by the above firm for the same gentleman. She will be fitted out with the most modern and powerful machinery under the Board of Trade inspection. Her dimensions are as follows:—80 ft. over all; 16 ft. 6 in. beam; 8 ft. 6 in. depth. The *May Flower* is designed to take the place of the previous *May Flower*, which is now engaged in Her Majesty's service.

**Blue Star.**—On June 15th Messrs. Hawthorn, Leslie & Co. launched from their shipyard at Hebburn a large steel screw steamer, being the third this year of similar size built by them to the order of Messrs. Carlisle & Co., Leadenhall Street, London. Her dimensions are:—Length, 310 ft.; breadth, 38 ft. 6 in.; depth, moulded, 22 ft. She will carry about 3,900 tons on light draught. The vessel has been constructed, under special survey, for the highest class for steel in Lloyd's registry, having cellular double bottom throughout. The inner strakes of the shell are lapped, and she is also fitted with web frames to give additional strength. Under the spar-deck, which extends to the after-end of the engine-room, will be provided most comfortable accommodation for captain, officers, and engineers, and a few first-class passengers amidships, the crew being berthed in a large forecastle. The engine and boiler rooms are well protected, and the lifeboats are carried on strong iron skids, standing 7 ft. above the deck. Steam steering gear, steam windlass, steam winches, double derricks and extra appliances will be fitted for the rapid loading and discharging of cargo, and the easy handling of the vessel at sea. The engines, built by the same firm, are of the triple-expansion type, with large boilers to work at 160 lbs. pressure, capable of developing 1,500 I.H.P. The vessel was named the *Blue Star* by Mrs. John Carlisle, of London.

**Durham.**—On June 15th a large steel, spar-decked screw steamer was launched by Messrs. Robert Stephenson & Co., Limited, from their shipyard at Hebburn. She has been built for Messrs. Money Wigram & Sons, Limited, London, and is of the following dimensions:—Length, 340 ft.; breadth, 41 ft. 3 in.; depth, 28 ft. 11 in. Both hull and machinery will take the highest class at Lloyd's. The vessel has a cargo poop aft, and a long bridge amidships, with cabins for the captain, officers, engineers, and passengers, and the crew are berthed in the topgallant forecastle. There is a cellular double bottom,

all fore and aft, for water ballast, and both main and spar decks are of iron. On deck there are four cargo hatches, at each of which stands a powerful steam winch, by Messrs. Clark, Chapman & Parsons, and one of their patent steam windlasses is fitted on the forecastle, the steam for the winches and windlasses being generated in a multitubular donkey boiler, placed in a house on deck. The vessel will steer from the bridge by means of Alley & M'Lellan's sentinel steam steering gear, and from aft with screw gear. The propelling machinery consists of a set of triple-expansion engines of the most improved type, capable of developing 1,800 H.P. The steam will be supplied from two large double-ended boilers, the working pressure being 160 lbs. The engines have been constructed at Messrs. R. Stephenson & Co.'s engine works, South Street, Newcastle. The vessel was named the *Durham* by Miss Stephenson, daughter of one of the managing directors.

**Wennington Hall.**—On June 15th there was launched from the shipbuilding yard of Palmer's Co., at Jarrow, a steel screw steamer of the following dimensions:—Length, between perpendiculars, 314 ft., breadth, moulded, 41 ft., depth, moulded, 24 ft. The vessel will be rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. She has a long raised quarter-deck. All the decks are of iron. The accommodation for captain and officers is provided in a sunk poop aft, the engineers' accommodation is at the aft end of the bridge, and the crew are berthed in the forecastle. Water ballast is fitted in a double cellular bottom, extending fore and aft; Clarke Chapman's direct steam capstan windlass is fitted forward, Harrison's steering gear amidships, and Hastie's screw gear aft. The vessel will load about 4,300 tons deadweight on Lloyd's freeboard. She was named *Wennington Hall* by Mrs. Banks, of High Moor House, Wigton, Cumberland. The vessel was built to the order of Mr. C. G. Dunn, of the Globe Shipping Co., Liverpool, and is constructed as a general cargo trader.

**Orotava.**—On June 15th the Naval Construction and Armaments Co. launched from their yard at Barrow another of the magnificent steamers built to the order of the Pacific Steam Navigation Co. She was named the *Orotava*, and is intended, along with the sister ship *Oruba*, launched some time ago, to run between Liverpool, South America, and Valparaiso. These two vessels will be by far the largest and quickest steamers ever engaged in the South American and Pacific trade. The *Orotava* is 450 ft. long, 49 ft. beam, and 37 ft. in depth. She is rigged with four masts, and her gross tonnage is 6,000 tons. The hull is constructed entirely of steel, on the longitudinal double-bottom principle, the whole of the material having been supplied by the Barrow Steel Co. There is accommodation for 890 passengers of various grades. The vessel has a complete installation of electric light in every part, no less than 500 incandescent lamps being used. She will be steered by steam, and on the orlop deck a large refrigerating machine is fitted capable of cooling 40,000 cubic feet of air per hour. The engines are of the triple-expansion type, indicating 6,500 H.P., steam being supplied by five double-ended steel boilers at a pressure of 160 lbs. The average speed of the vessel when fully laden will be about 16 knots.

**Eva.**—On June 18th there was launched from Mr. John Crown's Strand Shipyard, Sunderland, a steamer to the order of Messrs. Fenwick & Co., of Sunderland and Abchurch Chambers, London. On the vessel leaving the ways she was christened *Eva* by Miss Annie Potts, daughter of the superintendent engineer for the company, Mr. Cuthbert Potts. The *Eva* is 240 ft. in length; width, 35 ft.; and depth, 16½ ft., her deadweight being about 1,950 tons. She is classed 100 A 1 at Lloyd's, and will be schooner-rigged. She will be fitted with triple-expansion engines of 130 H.P. by the North Eastern Marine Engineering Co., South Dock. The cylinders will be 18½, 30, and 49 in. in diameter, respectively, having a stroke of 33 in. The vessel's boiler pressure will be 150 lbs., and she will be fitted up with direct steam windlass and capstan, four steam winches, and steam steering gear, with all the latest improvements. Captain Williamson, an old servant of the company, has been appointed to the command of the vessel, which is to engage in general trading. This is the third vessel that has been built by Mr. Crown for Messrs. Fenwick.

**Johanna Oelssner.**—On June 18th there was successfully launched from the shipbuilding establishment of Messrs. W. Harkess & Son, Middlesbrough, an iron screw steamer, which has been built to the order of Mr. John Pile, of London, for Mr. H. Vogemann, of Hamburg. Her principal dimensions

are:—Length, 203 ft.; breadth, 29 ft.; and depth, 15 ft. 10 in. She is specially adapted for the Hamburg and St. Petersburg general cargo trade, and is fitted with all the latest improvements. The vessel will have triple-expansion engines of 500 H.P., fitted on board by Messrs. Fisher & Co., of Paisley. On leaving the ways the vessel was christened the *Johanna Oelssner* by Miss Ridley, of Coatham.

#### LAUNCHES.—SCOTCH.

**Semiramis.**—On May 30th Messrs. Ramage & Ferguson launched from their yard, at Leith, a steel steam yacht, of 690 tons, y.m., built to the order of Mr. John Lysaght, of Bristol. Her dimensions are:—Length, 195 ft.; breadth, 27 ft.; depth, 16 ft. She will be fitted by the builders with engines 18 in. by 29 in. by 47 in. and 33 in. stroke, calculated to drive her at a speed of 12½ knots. The yacht on leaving the ways was named the *Semiramis* by Miss Beatrice Lysaght, of Springfort, Clifton, Bristol. When completed the yacht will proceed from Leith to Norway. This is the third vessel Messrs. Ramage & Ferguson have built for the same owner.

**Laverock.**—On May 30th there was launched from the shipbuilding yard of Messrs. John Scott & Co., at Kinghorn, a paddle passenger steamer, built to the order of the General Steam Navigation Co. Length, 216 ft.; breadth, 26 ft.; depth, 9½ ft. The vessel is of steel, and has compound direct-acting diagonal engines, electric bells, and bow rudder. She is to be employed in the passenger traffic in connection with the Paris Exhibition, and is to be placed on the passage between London Bridge and Boulogne. The vessel was launched with steam up, and on leaving the ways was named the *Laverock* by Miss Sinclair, daughter of the representative of the General Steam Navigation Co. in Scotland.

**Red Sea.**—On May 30th there was launched from the Caledon Shipyard, Dundee, a steel screw steamer for the Dundee, Perth and London Shipping Co. The vessel is of the following dimensions:—Length over all, 284 ft.; beam, 37 ft.; depth of hold, 22 ft. 11 in.; gross tonnage about 1,900 tons. The vessel has been built to the highest class at Lloyd's, and is fitted with triple-expansion engines from the Tay Foundry of her builders, Messrs. W. B. Thompson & Co., Limited. The vessel is constructed upon the cellular system. Five bulkheads further subdivide the vessel into watertight compartments. On the upper deck four steam winches are conveniently placed for the rapid handling of cargo. Steam for these and other auxiliary engines is supplied from a special boiler fired from the upper deck. Steam steering gear by Messrs. Alley & M'Lellan is fitted in the wheel-house, with controlling standard on the bridge above. On the upper deck aft is the main cabin, with state rooms and the captain's apartments. These are all fitted in solid oak, and form very roomy and handsome quarters. Under the bridge deck amidships is the officers' mess-room, with apartments for their accommodation on either side. On the fore part of the bridge deck is the chart-room and wheel-house, surmounted by the look-out bridge. Under the fore-castle rooms are provided for the seamen and firemen, and on the deck above is placed the steam windlass (Emerson, Walker's), which works the anchors in conjunction with a heavy anchor crane. Two iron light towers find a place on this deck. The engines are of the triple-expansion type, having cylinders 21, 33, and 54 in., with a piston-stroke of 42 in., each engine working on a separate crank. Steam is supplied from two single-ended steel boilers at a pressure of 160 lbs. per square inch. The whole of the vessel is lighted by electricity, this department having been entrusted to Messrs. Paterson & Cooper's local representative, Mr. Martin, of Glasgow. All the hold and deck lights are portable, those for the deck consisting of three-light clusters. Suitable connections are provided at frequent intervals, so that these portable lights may be used in any part of the vessel. In addition to the usual electric lighting of a steamer, the *Red Sea's* masthead, side and binnacle lights are all lighted by electricity, the vessel having in all about 90 lamps. The steamer has been provided with a Board of Trade passenger certificate, and has a complete equipment of boats, etc., in accordance with these requirements. As she left the ways the vessel was christened the *Red Sea* by Miss Daisy Kidd, daughter of Mr. J. W. Kidd, manager of the company. The ship was launched by Miss Williams.

**Galatea.**—On May 31st Messrs. Caird & Co. launched from their shipbuilding yard at Greenock a large and beautifully modelled steel paddle saloon steamer for the Caledonian Railway Co.'s passenger service at Gourrock. The following are the dimensions and particulars:—Length, 230 ft.; breadth, 25 ft.; and depth, 8 ft. She will be furnished by the builders with a pair of diagonal compound surface-condensing engines, with all the latest improvements. Steam will be supplied from four horizontal boilers, the pressure being 130 lbs. to the square inch. With a straight stem and elliptic stern, she presents a handsome appearance on the water. The vessel has been built with a flush main deck, with deck saloon houses fore and aft. The hurricane deck is amidships, in a line with the saloon deck houses, and forming in conjunction with them a continuous and unbroken promenade deck about 200 ft. long, and the full breadth of the ship. The accommodation provided is of the most ample description, including first and second class dining saloons, general saloon, ladies' and gentlemen's cabins, smoking rooms, bars, etc. She has been built and equipped to Board of Trade regulations and requirements, and with all appliances, including steam steering gear by Messrs. Muir & Caldwell, of the most improved description. As she left the ways the new vessel was named the *Galatea* by Miss Quita Caird, daughter of Mr. Robert Caird, shipbuilder.

**Helene Rickmers.**—On May 31st Messrs. Russell & Co. launched from their shipbuilding yard at Greenock a large spar-decked steel screw steamer for Mr. Rickmers, of Bremerhaven. Her dimensions are:—Length, 330 ft.; breadth, 42 ft. 6 in.; and depth, moulded, 28 ft. 10 in.; of 3,200 tons gross, with a deadweight capacity of 4,250 tons. On leaving the ways the new vessel was named the *Helene Rickmers*. She will be supplied by Messrs. Dunsmuir & Jackson, Glasgow, with triple-expansion engines of 1,800 I.H.P., and will be fitted with the latest and best appliances for rapid loading and discharging cargo. The *Helene Rickmers* is classed 100 A 1 at Lloyd's and in the French Veritas. She is intended for the rice carrying trade between Rangoon and Bremerhaven.

**W. E. Gladstone.**—On May 31st there was launched from the shipyard of Messrs. David Macgill & Co., Irvine, the hull of a steam trawler, 100 ft. long by 20 ft. broad and 11 ft. deep. She was named the *W. E. Gladstone*. She is one of a pair of steam trawlers which are being built at Irvine to the order of Messrs. Muir & Houston, Glasgow, and is to be fitted with compound engines, giving a speed of 11 knots an hour. Messrs. Macgill have orders from Messrs. Paul & Co., Dumbarton, for another trawler of somewhat smaller dimensions, the keel of which is to be laid immediately.

**Africa and Nigretia.**—Messrs. David J. Dunlop & Co., engineers and shipbuilders, launched last month two iron lighters, built to the order of the Royal Niger Co. (Chartered and Limited), of London, for up-river service on the West Coast of Africa. The dimensions are:—Length, 160 ft.; breadth, 32 ft.; depth of hold, 8 ft. 2 in., with a gross tonnage of 400 tons. These barges are fitted with three special hand cranes of powerful make for loading and discharging cargo, together with windlass forward and capstan aft for working bow and stern moorings. A galvanised iron corrugated roof extends all fore and aft as a sun deck, and for protection of deck cargo from the heavy rains experienced on the coast.

**Shanghai.**—On June 1st Messrs. Caird & Co., shipbuilders, Greenock, launched from their yard the splendid steel screw steamer *Shanghai* for the P. & O. Steamship Co., being the third of the four cargo boats ordered by the company last year for their India and China trade. Her principal dimensions are:—Length, 350 ft.; breadth, 42 ft.; and depth, 29 ft. 9 in. Her net registered tonnage is 2,047; gross, 3,168; and her carrying capacity is 5,100 tons deadweight. She will be supplied by the builders with powerful engines on the inverted direct-acting triple-expansion principle, of 2,200 I.H.P., and her two double-ended steel boilers have been constructed to sustain a working pressure of 160 lbs. to the square inch. The *Shanghai* is similar in every respect to the steamers *Bombay* and *Hong Kong*, both of which were lately built by Messrs. Caird & Co. for the P. & O. Co. She will fit out for sea at the Victoria Harbour.

**Nyassa.**—On June 4th there was launched from the shipbuilding and engineering works of Messrs. Alex. Stephens & Sons, Linthouse, a handsomely modelled steel screw steamer, of the following dimensions:—Length, 280 ft.; breadth, 37½ ft.; depth of hold, 20½ ft.; of the most improved well-deck type

having short poop and raised quarter-deck with long bridge, taking in the fore and main masts and topgallant forecable. She has been built for Messrs. Macley & McIntyre to the highest class at Lloyd's, and has been designed to carry about 3,200 tons of cargo. The vessel is constructed with heavy side frames and side intercostal keelsons, dispensing with hold beams, thus leaving the hold unobstructed for the storage of cargo of the bulkiest description. She has a double bottom on the cellular principle for water ballast, has four long hatchways, and is fitted with grainboards in accordance with the Board of Trade requirements for carriage of grain in bulk. Under the poop superior accommodation is provided for captain, officers, and two spare rooms, while the engineers are located at the fore end of engine casing, which extends forward and forms chart and wheel-house, with flying bridge above latter. The forecable is fitted up in the usual manner for seamen and firemen, with an iron companion entrance on the forecable deck, and, as the bridge and forecable are joined together by a short gangway, ready communication can be had fore and aft in the heaviest weather without the necessity of going down in the well. She is schooner-rigged, with steel pole masts, and is fitted with steam winches, steam windlass, steam steering gear, and all the most approved appliances for the rapid and efficient handling of ship and cargo. The engines, which were fitted on board before launching, are of the most improved triple-expansion type, having cylinders 21 in., 33 in., and 54 in. diameter, by 42 in. stroke, and supplied with steam from two steel boilers having a working pressure of 160 lbs. As the vessel left the ways she was named the *Nyasa* in the usual orthodox fashion by Miss Macley, Williamwood, Crosshill.

**Brablock.**—On June 11th Messrs. Barclay, Curle & Co. launched from their yard at Whiteinch a steel sailing ship of 2,000 tons register. She was named the *Brablock*, and will be under the management of Messrs. Aitken, Lilburn & Co., and commanded by Captain Smith, late of the *Castle Roy*.

**Portia.**—On June 11th Messrs. Caird & Co., Limited, Greenock, launched the steam yacht *Portia* for the Royal Yacht Squadron. When completed she will take a foremost place amongst the crafts of the squadron, for in addition to having beautifully cut lines, which, with powerful engines, will give her a high rate of speed, she is decorated and furnished internally with that charming elegance which is characteristic of the first-class vessels completed by Messrs. Caird. The *Portia* is 371 tons, yacht measurement, her length being 160 ft., breadth, 22 ft., and depth, 13 ft. 3 in., and the mean draught is 10 ft. 6 in. She is a fine-ended craft, with an elliptical stern and a clipper bow. The vessel has been constructed of steel. In addition to being built under special survey and classed 100 A1 at Lloyd's, Captain Newman, late master of the *Lancer*, who is to command the *Portia*, has superintended all operations in connection with the building. The accommodation provided has been arranged with great care to afford light and ventilation, and at the same time every convenience. An installation of the electric light has been supplied by Messrs. Siemens & Co., London, and a search light has been fitted on the foremast to assist in navigating the vessel at night. This in yachts is rather a novelty, and its value is too obvious to require comment. The craft has two masts, rigged fore-and-aft, which, with boom and bowsprit, are of Oregon pine. The sails have been provided by Messrs. Ratsey & Lapthorn. The deck furnishings of the vessel are complete, and are neatly finished. They include steam steering gear by Messrs. Rait & Gardner, and steam windlass by Messrs. Reid, Paisley. The propelling engines are of the triple-expansion type, designed to secure a speed of between 13 and 14 knots an hour on a small consumption of coal, so that not only is economy secured, but the distance which the vessel may sail without filling of bunkers is considerably augmented. The owner of the *Portia* is Mr. Herbert Foster, Queenbury, near Bradford, and the honours at the launch were performed by his sister-in-law, the Hon. Mrs. Robert Foster.

**Scotland.**—On June 14th there was launched from the Grangemouth Dockyard Co.'s shipbuilding yard at Grangemouth a handsomely-modelled steel screw steamer, built to the order of Captain Thomas Bech, for Messrs. Jens, Munich & Co., of Christiania, Norway. The principal dimensions are:—Length, 197½ ft.; breadth, 29 ft.; depth, 14½ ft. to main deck. The vessel is constructed on the awning deck principle, with ballast in cellular double-bottom under engines and

boiler, and in fore and after peak. She is built to the highest class at Norwegian Veritas, 1 A1, under the special inspection of Mr. Lauritz, M. Bodin, of London and Sunderland, principal surveyor to the Norwegian Veritas, and the vessel during construction has been under the superintendence of Captain Egnaess, of Christiania, who will take command of her on completion. The engines are being supplied by Messrs. Hawthorn & Co., of Leith. They are of the triple-expansion system, having cylinders 16, 24, and 24 by 30 in. stroke; two steel boilers 160 lbs. pressure, to indicate about 700 H.P.; speed, 11 knots. The vessel, which was named *Scotland*, has been specially built for trading between Grangemouth and Christiania, has accommodation for 65 first-class, 20 second-class passengers, and a number of third, and will be fitted with all the most modern appliances for working both ship and cargo, is lighted with the electric light throughout. The christening ceremony was performed by Mrs. Egnaess, wife of Captain Egnaess. The builders will immediately lay down a sailing vessel of 1,400 tons in the berth vacated by the *Scotland*.

**Ruth Bolton.**—On June 14th Messrs. Marr Brothers launched from their yard at Bridge Street, Leith, a wooden steam line fishing boat, named the *Ruth Bolton*, built to the order of Messrs. Robert Hardie & Co., North Shields. Her dimensions are:—Length, 77½ ft. between perpendiculars; breadth, 17 ft.; depth, 9 ft. The vessel will be engaged by Messrs. Baird & Barnsley, of North Shields. The builders have another boat of the same kind ready for launching, and they are about to lay down the keel of a sister vessel for Messrs. Hardie.

**Lord Aberdeen.**—On June 18th Messrs. S. McKnight & Co., Ayr, launched from their yard a steel screw steamer of 2,000 tons carrying capacity. Her dimensions are:—Length, 245 ft.; breadth, 34 ft.; and depth of hold, 17 ft.; class, 100 A1 in Lloyd's. She has a long raised quarter-deck, bridge amidships covering machinery space, short poop for cabin accommodation, and topgallant forecable for crew; water ballast in double bottom throughout; large hatches adapted for the reception of heavy machinery; and is fitted with all the latest improvements for expeditiously loading and discharging cargo. The engines are triple-expansion, having cylinders 21, 34, and 56 in. diameter, by 39 in. stroke; two steel boilers, 13 ft. 6 in. diameter by 10 ft. long; large donkey boiler, four steam winches, and Alley & McLellan's steam steering gear. Messrs. Hutson & Corbett, Kelvinhaugh, Glasgow, will supply the machinery. This vessel, which is for Messrs. James and Alex. Wyllie, Troon, will form a valuable addition to their fleet of steamers. On leaving the ways the steamer was named *Lord Aberdeen* by Miss Wyllie, sister of the owners. The construction of the vessel and machinery has been carried on under the superintendence of Mr. David Pollock, consulting naval architect and engineer, 128, Hope Street, Glasgow.

**Dunkerque.**—On June 18th there was launched from Messrs. Russell & Co.'s Kingston yard, Port Glasgow, the large four-masted steel sailing barque *Dunkerque*, which has been built to the order of Messrs. A. D. Bordes & Son, of Paris and Bordeaux. Her dimensions are as follows:—Length, 380 ft.; breadth, 46 ft. 6 in.; depth, 25 ft. 6 in.; and carries 5,000 tons dead-weight. She is fitted with cellular bottom fore and aft, and has a large water-ballast tank amidships, capable of containing 1,200 tons of water; this tank can also be made available for cargo purposes. She is fitted with all the latest improvements, including direct steam windlass supplied by Messrs. Emerson, Walker & Co., three sets of Mills's patent pumps, to which there is also attached one of Mills's fire engines; the pumps are wrought from steam winches, and are to be used in discharging the water ballast tank. She has also two donkey boilers and four steam winches, the latter being of friction type, made in Bordeaux, and of a kind that is worth the attention of our local engineers. The wire rigging is of hawser quality throughout, and is considerably in excess of Lloyd's requirements. The *Dunkerque* is built to Lloyd's and Veritas requirements, and has been superintended during construction by Mr. George Todd, the company's surveyor, and Captain L. Moizan, who is to command her. She has been constructed specially for the South American nitrate trade.

**Bawnmore.**—On June 18th there was launched from the shipbuilding yard of Messrs. Archd. McMillan & Son, Dumbarton, a fine steel screw steamer of 2,200 tons, named the *Bawnmore*. The vessel is built on the raised quarter-deck principle, with long bridge extending to foremast. She has a cellular double bottom for water ballast, and has web frames in lieu of 'tween

deck beams. The steamer is fitted with all the latest improvements, including electric lighting by the Woodside Electric Co. The owners are Messrs. Wm. J. Woodside & Co., Belfast, and the vessel is intended for general trade. The engines are triple-expansion of about 1,500 I.H.P. by Messrs. Dunsmuir & Jackson, Govan, and the speed expected is 10 knots when fully loaded.

#### LAUNCH.—IRISH.

**Camphill.**—On June 10th, a 1,200 ton steel barque, named the *Camphill*, was launched from the Foyle Shipyard. The vessel was built to the order of Messrs. Johnston & Co., Liverpool, and is of the following dimensions:—Length, 218 ft.; breadth, 36.3 ft.; depth, 22 ft. Her carrying capacity is 1,950 tons. The vessel was named by Mrs. Charles J. Bigger, wife of the builder.

#### LAUNCH.—GERMAN.

**Occident.**—On June 6th, the steel screw steamer *Occident* was launched by the Flensburg Shipbuilding Co. She is built for Messrs. A. Peterson & Co., of Flensburg, and has the following dimensions:—Length, 200 ft. 3 in.; breadth, 30 ft. 6½ in. Triple-expansion engines of 350 N.H.P. As the steamer left the ways she was christened by Miss Martha Steffenson.

#### TRIAL TRIPS.

**Duchess of Cornwall.**—It will be remembered that Prince Albert Victor named and launched the steamship *Duchess of Cornwall*, from Messrs. Wm. Gray & Co.'s yard, on the occasion of his visit to Sunderland, on the 1st of May. Since then the vessel has been fitted with triple-expansion engines and boilers at the Central Engine Works, and on May 29th proceeded to sea on her trial trip. She passed out of dock at three a.m., and proceeded at once to adjust the compasses, the duty falling upon Mr. Berry, of Church Street, West Hartlepool. This done, it was found the weather was not sufficiently clear to enable the measured mile posts to be seen, and therefore, to test the engines and boilers and ascertain approximately the speed, the ship was headed due east, the log thrown overboard, and the engines opened out to just under 90 revolutions per minute. They were kept running for an hour-and-a-half at that speed, when it was ascertained the speed of the ship was just 11 knots per hour, the I.H.P. being 840. The engines ran cool without the slightest drop of water being applied to any bearing, and the boilers maintained steam exactly at full pressure with a steadiness that was remarkable. It was also worthy of note that, with the expansion gears fully let out, the three engines indicated equal H.P. within the merest trifle. The smoothness of running of the engines and the total lack of vibration were points specially commented upon. The homeward run was made with a variation on the gear which gave 86 revolutions per minute and a speed of about 10½ knots per hour, everything remaining perfectly cool as before. Mr. Richard B. Chellev, of Truro, the owner of the vessel, was on board at the trial, and expressed himself highly satisfied with the day's doings.

**Tai-Cheong.**—On May 9th the new screw steamer *Tai-Cheong*, built by the Flensburg Shipbuilding Co., made her first trial trip, which had a very successful run as to speed and consumption of coals. This steamer is built for Messrs. H. C. Ed. Meyer & Co., in Hamburg, and has following dimensions:—Length, 234 ft. 9 in.; breadth, 32 ft. 8 in.; depth, 22 ft. 6 in. Triple-expansion engines of 700 N.P. She is a sister ship to the *Tai-Lee*, which was completed four weeks before. On the trial-trip Messrs. Meyer ordered a new steamer, in all parts like the *Tai-Cheong*, only 15 ft. longer.

**The Celtic.**—On May 22nd Messrs. Earle's Shipbuilding and Engineering Company, Limited, took out to sea for her trial trip the new steam fishing vessel *Celtic*, which they have just completed for the Grimsby Steam Fishing Company, Limited. This ship is slightly larger than her two predecessors, the *Arctic* and *Baltic*, but is generally similar in construction, and, like them, has been designed for line as well as trawl fishing, being provided with a perforated well and other special arrangements for that purpose. Before starting for Withersea the compasses were adjusted by the maker, Mr. O. T. Olsen, and a

course was then made for the measured mile, where most favourable results were obtained, the average of the runs with and against the tide giving a mean speed of 10½ knots when working up to 140 revolutions.

**The Ambaca.**—On May 28rd the new Portuguese mail and passenger steamer *Ambaca*, which Messrs. Earle's Shipbuilding and Engineering Company, of Hull, have built for the Empresa Nacional's service between Lisbon and the West Coast of Africa, was taken down the Humber on her trial trip. She is 840 ft. long, by 41 ft. beam, by 28 ft. depth of hold to top of floors, and is built of steel to Lloyd's highest class, with accommodation for 72 first-class, 82 second-class, and 120 third-class passengers, and is fitted with engines of about 2,800 I.H.P. When taken on the measured mile off Withersea the vessel was well down to her load draught, having 1,750 tons of cargo on board, and drawing 17-6 ft. of water. The results of the speed trials (an average of 14 knots) was considered in every way satisfactory. There was a plentiful supply of steam, and the engines worked very smoothly throughout.

**The Emir.**—On May 25th the cargo steamer *Emir*, built by Palmer & Co., at their Jarrow yard, to the order of the Bedouin Steam Navigation Co., Liverpool, was taken out on her trial and compasses-adjusting trip from the Albert Edward Dock, where she had taken on board 6,200 tons of coal (including bunkers) for Bombay. The *Emir* is a steel screw steamer of the following dimensions:—Length between perpendiculars, 375 ft.; breadth, moulded, 46 ft.; depth, moulded, 31½ ft.; rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. The vessel is fitted with a long bridge amidships, covering the engine space, and containing accommodation for the captain, officers, and about a dozen first-class passengers, and the engineers. The crew and firemen are berthed forward beneath the spar deck. The vessel is divided into seven watertight compartments by steel bulkheads, and water ballast is used on the cellular system fore and aft the ship and in the peaks. The vessel is fitted with a complete set of shifting-boards and grain feeders necessary for grain cargoes. Clarke, Chapman, & Co.'s direct steam double capstan windlass is fitted forward, and double capstans aft; Harrison's steam steering gear is fitted up amidships, and Napier's screw gear aft. Chadburn's patent telegraph for working ships in and out of harbours and docks, or dangerous places, is fitted upon the bridge and over the ship. The standard compass on board is Sir Wm. Thompson's patent. The steering compasses are supplied by Messrs. M. Walker & Son, Glasgow and Greenock. Speaking tubes connect the engine-room, chart-room, and captain's cabin with the steering bridge. Linklater's patent boat-lowering gear is fitted into each boat. The electric light is fitted all over the ship. The engines, which have also been supplied by the Palmer Co., are of the usual triple-expansion type. The trade for which the *Emir* has been specially built is that between Bombay and Liverpool, and sometimes Genoa. The result of the trial was in every way satisfactory. The mean speed attained over the measured mile was 11½ knots an hour, or 1½ knot beyond contract speed.

**Calais-Douvres.**—On May 27th the *Calais-Douvres*, a steel paddle steamer of about 1,200 tons register, built by the Fairfield Shipbuilding and Engineering Co. to the order of the London, Chatham, and Dover Railway Co., went down the Clyde on her official trip with a select company of ladies and gentlemen on board, amongst the latter being Captain Dane, commander; Mr. R. S. White, director of the Fairfield Co.; Mr. Lang and Mr. Syme, heads of the engineering department; Captain William Morgan, R.N., marine superintendent of the London, Chatham, and Dover Co.; Mr. William Kirtley, mechanical engineer of the company; Colonel D. R. McGregor, etc. The new steamer went on to the measured mile and made a series of test runs. She succeeded in reaching a maximum speed of 21½ knots per hour, and an average of 20½ knots, the revolutions being 50 per minute, an achievement which everyone considered eminently satisfactory. The *Calais-Douvres* has been specially constructed for the English Channel day service between Dover and Calais, and she has a double bow, with a rudder at both ends, with the view of facilitating her departure from the harbour at Calais, where there is little room for turning. Her dimensions are:—Length between perpendiculars, 325 ft.; breadth, 36 ft.; depth, moulded to upper deck, 21 ft. 6 in. She is built entirely of steel, and is divided into nine water-tight compartments, by which division the danger of sinking is much reduced. The engines are of the

compound-diagonal direct-acting type; with two cylinders and surface-condensers, and they are over 6,000 H.P. It is somewhat remarkable that her engines were constructed, put on board, and steamed in the short space of 85 working days, a very smart piece of work considering that they are a set of engines capable of developing about 7,000 H.P. The *Calais-Douvres* is fitted with all the latest improvements. The boilers, four in number, are of steel, and are adapted for a working pressure of 110 lbs. to the square inch. There is a complete installation of electric light, including embarkation lamps, supplied by a dynamo worked by independent engines. There are also steam capstan windlass forward, steam warping capstan aft, steam and hand steering gears for after rudder, hand-steering gear for bow rudder, Downton pumps, life-boats with quick-lowering gear, life-rafts, etc. The *Calais-Douvres* was under the charge of Mr. White, while Mr. Lang superintended the working of the engines. The steamer is intended purely for passengers and mails, and it is expected that she will accomplish the distance between Calais and Dover under an hour. The Fairfield Co. has already built the *Empress* and *Victoria* for the same company, the former having completed the run in 60 minutes 5 seconds. The *Calais-Douvres* will beat this. She has accommodation for 900 passengers, her promenade decks are especially wide and convenient, and she has state-rooms for the accommodation of private parties, while on the upper deck there is a handsomely-fitted royal state-room.

**The Crown.**—On May 27th a large company of ladies and gentlemen joined the screw steamer *Crown*, at Blyth, for the purpose of proceeding with that vessel on her official trial trip. The *Crown* is 260 ft. in length, and has been built to the order of Messrs. Dent & Co., of Newcastle and Blyth (for the Crown Shipping Co., of Newcastle), under the superintendence of Captain Patterson, of South Shields. The machinery, which has been supplied by the North Eastern Engineering Co., of Wallsend, gave the greatest satisfaction to all on board by the excellent results obtained. Both engines and boilers have been built under the care of Mr. J. Baxter, engineer, of Newcastle. After several successful runs on the measured mile and a run south, the *Crown* returned to the mouth of the Tyne, where the company was taken on board the tug in attendance, and the *Crown*, under the command of Captain Tindall, proceeded to Middlesbrough to load.

**Holme Eden.**—On May 28th the steel screw steamer, *Holme Eden*, built by Messrs. J. Readhead & Sons, South Shields, to the order of Mr. W. Wright, of London and South Shields, proceeded to sea on her trial trip. The vessel is of the following dimensions:—290 ft. long, 89 ft. broad, and 20 ft. deep. She is built on the improved well-decked system, having poops, long raised quarter-deck, bridge amidships, and top-gallant fore-castle. She is classed 100 A 1 at Lloyd's, under special survey, and equipped in keeping with all the requirements of the Grain Cargoes Act, and with the most recent approved appliances for discharging cargoes, etc. She is fitted with engines of triple-expansion type, having cylinders of 23 by 37½ by 61½, with a stroke of 39 in. The engines are supplied with steam from two large steel boilers, working to pressure 160 lbs. per square inch. They have been built under the superintendence of Mr. William Menzies, Newcastle, and the hull under the supervision of Captain G. W. Freeman. The *Holme Eden* is a vessel of 3,450 tons deadweight carrying capacity. She is the fourth steamer built by this firm for Mr. Wright. The trial was satisfactory to owner and builders alike, a speed of 11½ knots having been registered over the measured mile. On her return to the harbour the steamer proceeded to Tyne Dock, where she will take in a cargo of coal for Genoa. She will be under the command of Captain Freeman.

**Italia.**—The steel screw steamer *Italia*, built by Messrs. Armstrong, Mitchell & Co., for the Hamburg-American Packet Co., of Hamburg, has lately been tried at sea with the most satisfactory results. The vessel is 259 ft. long, 43 ft. 6 in. beam, and 31 ft. 9 in. depth, moulded. She is built to the highest class at Lloyd's and Veritas, and has two ranges of 'tween decks fitted up for emigrants, of which she will carry about 1,200. The vessel has been built exclusively as an emigrant and cargo ship, and her emigrant berths are of iron, ble and interchangeable, and can be very readily in the return voyage so as to carry cargo in the The *Italia* is fitted with triple-expansion

engines by the Wallsend Slipway and Engineering Co., which indicated 2,100 H.P. and gave a speed of over 12 knots.

**The Oruba.**—On June 1st the new liner, the *Oruba*, of the Pacific Steam Navigation Co., had her sea trial, making a fine run of 200 miles. She was built by the Naval Construction and Armament Co., of Barrow-in-Furness; and Lord Hartington, the chairman, and Lord Brassey, the vice-chairman, accompanied the vessel on her trip, as did also Admiral Boys, the trial being under the charge of Mr. Bryce Douglas, the managing director. The chairman of the Pacific Co., Mr. Robinson, and the deputy-chairman, Mr. Rankin, also attended the trial, and there was a large party of visitors, numbering nearly 80. The *Oruba* has accommodation for 130 first-class passengers, 90 second, and 650 third-class. The vessel left Birkenhead Docks at midnight, being lighted throughout by electric light, by means of over 700 incandescent lamps. A run was made to the Welsh coast, at the speed of 15½ knots per hour. The vessel is beautifully fitted, forethought and consideration being everywhere apparent. The *Oruba* will be put on the South American line from Liverpool to Valparaiso, and will probably sail at the end of this month. Captain Massey will be in command.

**Pocasset.**—On June 1st the screw steamer *Pocasset*, built and engined by Messrs. Robert Stephenson & Co., Limited, of Newcastle, was taken on her trial trip. The principal dimensions of the vessel are:—300 ft. between perpendiculars, 39 ft. breadth, and 27 ft. 6 in. depth, moulded, with a carrying capacity of 3,750 tons. She has been built under the superintendence of Mr. George Hepburn, of Liverpool, for the Mediterranean and New York Steamship Co., Limited, for whom Messrs. Phelps Brothers & Co., of Liverpool, are the managers, and is intended for the Mediterranean and New York trade. She is fitted with triple-expansion engines of the latest type, having cylinders 25 in., 39 in., and 62 in. diameter respectively, with a stroke of 42 in., and supplied with steam from two extra large steel boilers, working at a pressure of 155 lbs. per square inch. Four runs were made on the measured mile, when a mean speed of 12½ knots was attained. The engines worked without a hitch, and the owners' representatives on board expressed themselves as highly satisfied with the ship's performance throughout.

**Talavera.**—On June 1st the new screw steamer *Talavera*, which has been built by Messrs. W. Dobson & Co., Low Walker, for Messrs. H. Scholefield & Son, Newcastle, went to sea for a trial trip. The vessel, which is an exceedingly handsome steamer, is of the following dimensions:—Length, 265 ft.; breadth, 37 ft.; draught, 17½ ft., and is fitted with every modern appliance for quick and economic working of the steamer. The machinery, which has been built by the North Eastern Marine Engineering Co., Limited, Wallsend, is of the tri-compound type, with cylinders respectively 20, 33, and 54 in., and a stroke of 39 in. During the trial the engines worked with perfect smoothness and regularity, and the excellent working of the machinery gave great satisfaction. The speed of the vessel on the measured mile was equal to 10 knots, which was considered highly satisfactory.

**Ringmoor.**—On June 4th the s.s. *Ringmoor*, built by Messrs. Schlesinger, Davis & Co., Wallsend-on-Tyne, to the order of the Ipswich Steam Shipping Co., and intended for their trade between Ipswich and London, was tried over the measured mile at Hartley with very satisfactory results, a mean speed of 10 knot being attained. The dimensions of this vessel, which has been specially designed for the purpose of carrying heavy machinery, are:—142 ft. by 21 ft. by 10 ft. 8 in., moulded. She has been fitted by Messrs. Ernest Scott & Co., Newcastle-on-Tyne, with triple-expansion engines, having cylinders 13½ in., 21 in., and 35 in., stroke 27 in., and supplied with steam from a steel boiler working at a pressure of 160 lbs. per square inch. During the trial the machinery worked well and gave every satisfaction to the representatives of the owners, who were on board.

**Beeswing.**—On June 5th the finely-modelled screw steamer *Beeswing*, recently launched from Messrs. Palmer & Co.'s Howdon Yard, was taken out on her trial trip. The *Beeswing* is a steel screw steamer of the following dimensions:—Length, between perpendiculars, 265 ft.; breadth, moulded, 39 ft. 6 in.; depth, moulded, 24 ft. 7 in. The vessel is built to class 100 A 1 Lloyd's, spar deck type. She will load 2,900 tons deadweight. The *Beeswing* has been built to the order of Messrs. Bowser, Ormston & Co., Newcastle. During the trial on the measured mile the speed was at the rate of 12 knots an hour.

**Caledonia.**—On June 5th the new saloon paddle-steamer *Caledonia* (belonging to the Caledonian Steam Packet Co., Limited, who placed the order with Messrs. Rankin & Blackmore, Eagle Foundry, Greenock, on the 20th November last) went down the river on her official trip. In spite of the severe test of two runs between the Cloch and Cumbrae Lights, and six progressive trials on the measured mile, a most brilliant success was recorded, as no less a speed than 19½ statute miles was attained with the best run, the average being nearly a quarter-of-a-mile over the guaranteed speed. The *Caledonia*, which has been built by Messrs. John Reid & Co., of Port Glasgow, is a beautifully-modelled vessel, 200 ft. long by 22 ft. beam, and 7 ft. 9 in. moulded depth, and has an upright stem and elliptical stern. In addition to the usual wing-houses, there is a deck saloon house both before and abaft the machinery space, and they, as well as a continuous and unbroken promenade deck (about 150 ft. long) extend the full width of the vessel, and add much to the general accommodation. The dining saloon is placed forward, which most cabin passengers will esteem a great improvement. It is about 20 ft. long, and is particularly light and airy. An ample bar and restaurant have been provided, with all requisite fittings, and the accommodation generally is exceptionally good, including captain's and officers' cabins, etc., everything being finished in a most tasteful manner. Amidships stands an exceedingly neat ticket office of polished teak, with large windows all round, and above this stretches the bridge and steering platform, rendered unusually attractive by the array of bright brass docking and engine telegraphs, specially constructed for the *Caledonia* by Messrs. Chadburn & Son, of Liverpool. The machinery was constructed by the contractors, Messrs. Rankin & Blackmore, and, like the hull, embodies several novel features. The engine is of the diagonal compound surface-condensing type, having two cylinders 80 in. and 54 in. diameter, by 5 ft. stroke, working tandem on a single throw crank shaft. Roughly speaking, this engine represents the standard single cylinder Clyde type, but with the addition of a tandem high-pressure cylinder, so that the great gain in economy of the compound engine is secured without the complication of the usual double crank design. Steam at 90 lbs. pressure is generated by two navy boilers, working in conjunction with forced draught (supplied by a Westinghouse engine and fan, made by Messrs. Alley & McLellan, of Glasgow) on the closed stoke-hole principle, forming quite a new departure so far as Clyde river steamers are concerned, as the *Caledonia* is the first vessel thus fitted, and judging from the undeniably successful results of the trial as to speed, economy of fuel, and comparative absence of the dense black smoke so characteristic of the haystack boiler, which has up till date been the prime favourite on the Clyde, it seems unquestionable that the latter must perforce give way to its more modern rival, which has many other advantages in its favour, such as taking up less deck room, and being much more accessible for repairs. In order to still further abate the smoke nuisance Bonthron's patent furnace bars and doors have been fitted to these boilers, and the result of this, we understand, the first application of them in combination with forced draught, will be awaited with interest.

**Elba.**—On Friday morning, June 7th, the s.s. *Elba*, which has been built for the English and American Shipping Co., under the management of Messrs. C. T. Bowring & Co., of London, by Raylton Dixon & Co., Cleveland Dockyard, Middlesbro', proceeded on her trial trip from the Tees. This vessel is of the raised quarter deck type with long bridge, her dimensions being: Length over all 305 ft. 3 in.; breadth 38 ft.; depth moulded 22 ft. 10 in., with a deadweight capacity of 3,600 tons. Her engines, which have been fitted by Messrs. T. Richardson & Sons, of Hartlepool, with cylinders 23 in., 37 in., and 61 in. by 42 in. stroke, worked most satisfactorily on trial, and the vessel proceeded immediately to Hamburg. The vessel and machinery have been built under the superintendence of C. M. Jacobs, Esq., of London, consulting engineer. This is the sixth steamer Messrs. Dixon have built to the order of Messrs. Bowring.

**Eclipse.**—On Friday, June 7th, the screw tug *Eclipse*, built to the order and from the designs of Messrs. James Watkins & Co., 131, Fenchurch Street, by Messrs. Westwood, Baillie & Co., London Yard, Poplar, took her trial trip. The tug has been sold to the British India Steam Navigation Co., who were represented on the trial by Captain Hodgkinson, R.N., Naval Officer, and Mr. Clark, superintendent of machinery. Dimensions:—80 ft. by 16 ft. 6 in. by 9 ft. 6 in. Engines, by Messrs. John Stewart & Son, Blackwall, triples; cylinders, 12 in. by

18½ by 20, 20 in. stroke. Boiler, cylindrical, steel, 160 lbs. The machinery worked without a hitch, and developed 341 H.P. The vessel, although rigged and coaled with 84 tons fuel ready to start for Calcutta, more than fulfilled stipulations as to speed, draught, and towing powers.

**Begonia.**—On June 7th the new steam line fishing vessel *Begonia*, built to the order of the North-Eastern Steam Fishing Co., Limited, Grimsby, by Messrs. Cochrane, Cooper, & Schofield, of Beverley, was taken for her trial trip. The vessel is over 106 ft. long; in breadth over 20 ft., and in depth over 11 ft., and is 165 tons gross. Her engines are triple direct-acting 50 H.P. The ship is fitted and furnished with all the latest improvements, and the engines were supplied by Messrs. C. D. Holmes & Co., of Hull. The vessel gave very great satisfaction, attaining the speed of 10½ knots.

**Delmar.**—On Saturday morning, June 8th, the s.s. *Delmar* took her trial trip from the Tees. This vessel, which has been built by Messrs. Raylton Dixon & Co., Middlesbro', to the order of Messrs. G. Tweedy & Co., London, is of the following dimensions:—Length over all, 305 ft. 3 in.; breadth, 38 ft.; depth moulded, 22 ft. 10 in.; with 3,600 tons deadweight. She is built on the partial awning deck principle, with bridge connected to topgallant forecabin and a raised quarter-deck aft. Her engines have been fitted by Mr. George Clark, of Sunderland, and are of 210 H.P. nominal with cylinders 23 in., 37 in., and 61 in., by 42 in. stroke. After adjusting compasses, the *Delmar* made her trial run from the Tees to the Tyne, everything working with entire satisfaction to Mr. J. H. Pearson, of the firm of Messrs. G. Tweedy & Co., and a party of friends on board. The *Delmar* will load in the Tyne.

**Hans Jost.**—On June 8th the steel screw steamer, *Hans Jost*, built by the Flensburg Shipbuilding Co., made her trial trip. This steamer has the stock number 100, and, on account hereof, there was invited a large party to partake of a splendid dinner on board. A few days after the trial trip, the Shipbuilding Co. gave a dinner for all workmen in the yard, about 1,200; for their wives and children there was provided summer amusements in the garden, and ball afterwards. The ship is named after Mr. Hans Jost, who was one of the first who started steam shipping business in Flensburg. Her dimensions are:—Length, 217 ft.; breadth, 31 ft. 1½ in.; depth, 16 ft. 10½ in. Triple-expansion engines of 500 N.H.P.

**King Orry.**—This well-known Isle of Man boat has just undergone considerable alterations and improvements in her machinery at the hands of the Fairfield Shipbuilding and Engineering Co., and on June 8th was taken down the Clyde for a trial, the results obtained exceeding what was anticipated, and giving the greatest satisfaction to the owners. She was originally built by Messrs. Robt. Duncan & Co., and had a speed of 15 knots. Last year the Isle of Man Steam Packet Co. had the ship lengthened and fitted with new engines and boilers, when it was found that the speed was increased to about 15½ knots. The result not being what was expected, the vessel was placed in the hands of the Fairfield Co., who have effected such changes in the machinery that on trial on the measured mile at Skelmorlie a mean speed of 18½ knots was obtained, being an increase of about three knots. Afterwards the vessel was tried between the Cloch and Cumbrae lights and the mean of two runs gave a speed of 17½ knots. The vessel afterwards proceeded to Douglas, and will at once go on her station.

**Mamari.**—On June 11th this vessel left Sunderland for her trial trip, having been completed by Messrs. Wm. Doxford & Sons, for the Shaw, Savill & Albion Co., Limited, of London. After having compasses adjusted she was taken on to the measured mile and attained a mean speed of 12½ knots per hour, giving every satisfaction. She then left direct for Hamburg, where she arrived in 29½ hours. During construction she has been superintended by Commander John McKirdy, her engines being under the superintendence of the company's engineer, Mr. Carrick.

**Girghenti.**—On June 12th the new screw steamer *Girghenti* left Sunderland for a trial trip. This vessel, which has been built by Messrs. Blumer & Co., Sunderland, for Messrs. Sloman, of Hamburg, is of the following dimensions:—Length, 250 ft.; breadth, 32 ft.; draught, 17 ft. 10 in.; and is fitted with every modern appliance for quick and economical working. The engines, which have been built by the North Eastern Marine Engineering Co., Limited, Wallsend, are fitted with all the

latest improvements. Throughout the trial the machinery worked with perfect smoothness and regularity, and gave great satisfaction to all concerned. During construction both ship and machinery have been inspected by Mr. Van Essen, of Hamburg.

**Moorish Prince.**—On June 14th the steamer *Moorish Prince*, which has been built by Messrs. Short Brothers, Sunderland, to the order of the Prince Steam Shipping Co., Limited, Newcastle, of which Mr. James Knott is managing director, went on her trial trip. Although the vessel was light and the propeller was only partly immersed, a speed of 12 knots was obtained over the measured mile. During the run the engines, which were supplied by Mr. John Dickinson, ran very smoothly, and developed a high indicated power, steam being easily maintained at 150 lbs. pressure during the run.

**Sarah Radcliffe.**—On June 18th, the new steel steamer *Sarah Radcliffe*, just completed by Messrs. Ropner & Son, Stockton-on-Tees, had her trial trip from the Tees. After taking in bunker coal at Connal's Wharf, she steamed down the river into the bay, where her compasses were adjusted, after which a very satisfactory trial of speed was made, the steamer attaining 10½ knots. This vessel forms one of Messrs. Evan Thomas Radcliffe & Co.'s fleet of Cardiff. She has been built under the supervision of Captain Venables, and will carry 8,800 tons deadweight; her engines and boilers are by Messrs. Blair & Co., Limited.

**Excelsior.**—On June 19th the steamer *Excelsior*, which has been built by Messrs. Cook, Welton, & Gemmell, engined by Messrs. Bailey & Leatham, and which was only launched a few days ago, went on her trial trip. The vessel is built on the same lines as her predecessors belonging to the Humber Steam Trawling Co. An excellent run was made down the Humber, and a long run was afterwards made to sea, the results of the trial proving most satisfactory. When about 15 miles from Spurn, the trawl was shot for the pleasure of the visitors, and again the vessel was headed toward the Humber. Times and distances were run which showed that an average was made of nearly 11 knots per hour.

**Melpomene.**—On June 19th the *Melpomene*, one of the numerous second-class protected cruisers, which was built at Portsmouth and engined by Messrs. Palmer & Co., Jarrow-on-Tyne, made a highly successful 12 hours' full-power trial of her machinery under natural draught, returning into harbour in the evening. The contract power with open stokeholds is 5,600 horses, the test being rather one of sustained endurance than of power. With an average of 128 revolutions a mean I.H.P. of 6,216 was obtained, and a speed of 17.383 knots on the measured mile. During the trial the log showed that a distance of 212 knots had been run. A trial of four hours under forced draught will complete the ordeal previous to acceptance.

**Laverock.**—On June 21st the new and splendid steamship *Laverock*, which has been added to the fleet of the General Steam Navigation Co., and has been licensed by the Board of Trade for passenger traffic between London, Yarmouth, Margate, Ramsgate, and Boulogne, was taken down the river for her official trial trip, and a party of about 250 gentlemen, representing the trading connection of the company, who had received invitations from the directors to attend it, joined at Fresh Wharf, London Bridge, at 11 o'clock for that purpose. The *Laverock*, spick-and-span new from the hands of her builders, and constructed on new principles expressly to meet the various requirements of the service on which she is to be engaged, made a favourable impression on her visitors at the very first glance, and the further experience of her qualities which was gained later on in the day led to the general conviction that she will afford as luxurious marine travelling as the skill and enterprise of the day can devise. She has been built and engined by Messrs. John Scott & Co., of Kirkcaldy, who appear to have executed their commission in a highly satisfactory manner, and with a degree of expedition for which they also deserve credit. Her keel was laid in the autumn of last year, and in May last she was launched and practically ready for sea. She is 215 ft. in length, and has 26.6 ft. beam, with 9.6 ft. depth of hold. Her engines, which are of the compound diagonal type, are of 1,800 H.P. indicated, and, making 40 revolutions per minute, propel the vessel at an average speed of 19 miles per hour. At her trial trip in the Firth of Forth, where her powers were first tested by the company, her speed was 18½ statute miles per hour, but when in working condition, and she has received final adjustments

which experience of her will suggest, a better result will no doubt be achieved. She is built entirely of steel, and has a bar keel to steady her in a sea way, and also to give her the strength and rigidity she should have when steaming at the high speed which is intended. Her girders and frames, especially in the after part, are of exceptional strength, and her plates are treble-riveted. When fully laden, her draught is only 5 ft. 6 in. The *Laverock* is the fourth vessel built by the company for this particular service. Her three predecessors are the *Halcyon*, the *Mavis*, and the *Oriole*, and she is already about to have a successor in the *Philomel*, which in a few days time will arrive in the Thames from the same building-yard. The *Halcyon* made her official trial trip on July 27th, 1887. She was an experimental vessel, the first of the present type of these steamers, and designed by the officers of the company with a view to determine the best form of vessel to be a good sea boat, to carry comfortably a large number of passengers, and make the journey between London, Margate, and Ramsgate at a high speed and in all states of the weather. In the vessels which have followed the *Halcyon*, successive improvements have been effected, and the *Philomel*, which has been built on much the same principles as the *Laverock*, very much surpasses her in dimensions and in power, and it is confidently anticipated by the company that when the *Philomel* is in complete working order she will steam with ease at the rate of about 22 miles an hour, and that without forced draught or other artificial aid. The *Laverock*, which well represents this new class of vessel, is a light ship, possessing great stability in the water, as has been thoroughly tested, great engine power, great capacity, excellent ventilation, and lofty cabins. Together with these structural arrangements, the upholstery, decorations, fittings, and details have been supplied on a liberal scale; and it is probably not too much to say that these vessels will be unrivalled in the comfort and advantages they will offer to their passengers. As regards the sea-going qualities of the *Laverock*, it may be stated that she gave a very satisfactory specimen of them during her run to the Thames from the North. She bore bravely the severe test of the north-easterly gale which swept over the North Sea on Bank Holiday, making her way through heavy seas which had force enough to break to pieces the stout glass panes in two of the lower cabin-lights, the upper ones remaining intact. In point of stability her "behaviour" on this occasion was said to be absolutely perfect. The *Laverock* has a broad and splendidly-constructed upper or awning deck, and on the main deck is a luxurious lounging saloon, with lofty ornate ceiling, and fitted with comfortable couches and sofas, like the other vessels of the same class. The ladies' private cabin has been enlarged several feet, and important improvements have been introduced into the parcels room and the luggage room. The dining saloon is spacious and lofty, and increased light has been given it by raising the port-holes some 18 in. As regards, also, appliances for working the ship, some advance has been made. At either end of the ship is a simple and ingenious machine which, on a valve being touched, rotates with great force and rapidity, and in the course of a few seconds hauls in the slack or mooring ropes, and thus considerably reduces the risk and the rolling of the vessel when brought alongside Margate Jetty or the Admiralty Pier at Dover. The *Laverock*, under the command of Captain Sergeant, left her moorings at Fresh Wharf at a few minutes past 11 o'clock. During the run her motion was remarkably steady, and the visitors had every opportunity of inspecting her, Mr. Cattarns, on the part of the company, affording all the necessary explanations. In passing through the Lower Hope the vessel made her run at the measured mile which showed a speed of 18½ miles, but from this result half a mile was taken off as being due to the tide, and 18 miles was the estimated speed.

**Winnie.**—On June 21st the new steel screw steamer *Winnie* recently launched by the Grangemouth Dockyard Co., went down the Firth of Forth on her official trial trip. The weather was fine, and a large number of guests accompanied the steamer, including the builders, Messrs. Spence & Miller, and the owner, Mr. C. Neilson, of West Hartlepool, and Mr. Leckie, West Hartlepool, etc. The vessel is a steel screw steamer, built to the highest class at Lloyd's. Dimensions as follows:—Length, 280 ft. by 37 ft. by 19 5-12 ft. She has a long bridge to forward of fore-mast, with short poop aft to captain and topgallant forecastle for crew. She is fitted with a set of triple-expansion engines by Messrs. Hutton & Corbett Kelvinhaugh Engine Works, Glasgow. Cylinders 19, 31, and 51 by 39 in. stroke, and supplied with steam by two large

steel boilers at 160 lbs. pressure. All the latest improvements for working both ship and cargo have been introduced, including steam steering gear and M'Onie's patent windlass, besides Hastie's patent screw gear and rudder brake. The vessel is built for general cargo trade to the order of Messrs. C. Neilson & Sons, West Hartlepool, and will carry a deadweight of about 2,750 tons. On the trial everything worked in a satisfactory manner, and all parties concerned expressed themselves as highly pleased.

### JOY'S VALVE GEAR.

IN the notice of the trial trip of the Italian armour clad, *Ruggiero di Lauria*, which appeared in our last issue (vide page 109) we stated, speaking of Joy's valve gear as fitted to her engines, that these engines were "by far the largest to which this type of gear has been applied."

We should here state that the engines of the *Re Umberto* of 20,000 H.P. (by contract) and those of the French cruiser, *Le Itoy*, of 12,000 H.P., are both fitted with this type of gear.

### Miscellaneous.

A LARGE Russian Steam Navigation Co. is about to be formed for the navigation of the Oxus. It is intended to commence with four or six paddle steamers, and to increase the fleet to 20 within two or three years.

TORPEDO BOATS FOR THE ARGENTINE REPUBLIC.—Messrs. Thornycroft & Co., torpedo boat builders, of Chiswick, have secured an extensive order for boats from the Government of the Argentine Republic.

THE "MEDUSA."—Another new cruiser has been added to the effective strength of the Navy by the completion for sea of the *Medusa*, which has been built at a cost of about £160,000. She is to undergo a series of experimental trials at Portsmouth, and the ship left Sheerness for Spithead on Saturday for that purpose. The trials are to be completed by July 2nd, when she is to return to the Medway to be prepared for taking part in the naval manoeuvres.

RUSSIAN IRONCLAD.—The new Russian ironclad *Emperor Nicholas the First* was on Saturday, June 1st, successfully launched from the wharf of the Franco-Russian Co. at St. Petersburg. The ceremony was attended by the Emperor and Empress, the members of the Imperial family, and a brilliant assembly of officials. Prior to the launch, their Majesties laid the keel of the new ironclad *Gangut*, and of the gunboat *Gromidetchi*.

"IMPORTANT TO BRITISH SHIPBUILDERS."—The British Consul at Gothenburg in his last report has under this caption the following observations:—"An important steamship company in this place, after issuing tenders for the building of a passenger and cargo steamer of about 500 tons register, received ten tenders, of which five were from English, four from Swedish, and one from a German firm. The prices from these latter firms exceeded by far those of the English competitors, and the steamer was ultimately built by one of the English firms, whose tender was £4,200 lower than the cheapest Swedish, and £1,370 lower than the German offer. The importance of such a fact leads to the conclusion that if English manufacturers made themselves more known in foreign countries, either by travellers acquainted with the language of the country they visit, or by means of advertisements, they might easily open up new channels for their industries."

PASSENGER SHIPS.—When the passengers of a "passenger ship" are taken off it or are picked up at sea from a boat, raft, or in any other way, the expenses thereby incurred may be defrayed by the Home Secretary if the place to which they are conveyed is in the United Kingdom. If the place is in a colony this may be done by the Governor, and if in a foreign country, by Her Majesty's Consular officer. Moreover, if a ship's passenger finds himself, without any neglect or default of his own, in any colonial or foreign place other than that for which his ship was originally bound, the Governor or the Consular officer may forward him to his intended destination

should the master of the ship fail to do so. However, the ships to which these enactments in the Passenger Acts apply are restricted in number. For instance, in order to come within these Acts, the ship must be carrying more than 50 passengers, or a greater number than is proportionate to one passenger to 33 tons for a sailing vessel, or one to 20 tons for a steamer. Again, if the ship be proceeding on a voyage from the United Kingdom it must be going to some place out of Europe not being within the Mediterranean Sea; and if the voyage be from a colony it must be a long one. A very comprehensive signification is, however, now proposed to be given to the term "passenger ship" for the purpose of these enactments. A Bill introduced by Lord Knutsford would make it include every description of sea-going vessel carrying one or more passengers on any voyage from any place in Her Majesty's dominions to any place whatever.

THE SHIPBUILDING TRADE.—In his monthly report to the United Society of Boilermakers and Iron Shipbuilders, the general secretary, Mr. R. Knight, says:—"The returns from all our large districts show that there is an abundance of work for all hands. For a considerable number of years the shipbuilding trade has not been in such a brisk and flourishing condition as it is at present. All the yards in all the districts are full of work, which makes the outlook for our members for the next 12 months a most cheering one, which we hope they will take advantage of, and 'make hay while the sun shines.' We learn that enquiries are as numerous as ever, but builders are now all pretty full up. In several establishments there is a scarcity of workmen, and in consequence operations are to some extent retarded. The proposed strengthening of the Navy is beginning to take practical shape. During the last day or two the Admiralty tenders have been issued to shipbuilders for a number of second-class cruisers of the *Marathon* and *Magicienne* type, with engines of about 9,000 I.H.P. The tenders have been distributed among some 20 shipbuilders all over the country, on the Tyne, Wear, and Clyde, as well as at Hartlepool and Belfast, and the work will be divided as fairly as possible among them, provided, of course, the tenders are favourable. Engineers, too, have been asked to tender for three first-class cruiser engines of 12,000 I.H.P. As the tenders have to be sent in by the 20th of this month, it is probable that by July next several orders will have been given out. The prospect of this work will most likely further stimulate prices. We informed you in a previous monthly that great hopes were entertained by us that an established price list would soon be agreed upon between the Clyde employers and ourselves for the better regulation of work in that district; but, for the time, our hopes have been blighted by the employers refusing to agree to a price list that will be acceptable to the Clyde members, and which is considered by them would only be a fair remuneration in the present state of the labour market, taking into account the class of work done and the method of doing it."

### Recent applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, from May 16th to June 15th, 1889.

- 7738 H. C. Vogt. Fish tail propeller.
- 7743 W. O'Keefe & T. E. Creer. Compass card.
- 7798 J. Casey. Life-saving camp stool.
- 7801 W. Heslop. Boats.
- 7808 A. Julian. Alarum and valve attachment to water, &c., gauges.
- 7841 H. H. Chilton. Ships' berths.
- 7842 W. Sunderland. Mechanical stokers.
- 7912 L. Ferrière, W. Glover, & W. H. Hobson. Rotary engines.
- 7915 E. S. Higgins. Quick firing guns.
- 7917 M. Nicholson. Delivering coal into ship's holds.
- 7996 G. Moir. Consuming smoke in boiler furnaces.
- 8005 J. Proctor. Mechanical stoker.
- 8017 D. P. Wall. Sailing and steam boats.
- 8023 Thompson (A. G. E. Hope). Ship's berth tables, etc.
- 8026 C. J. Dorrance. Steam boiler furnaces.
- 8044 Newton (W. Walker & W. M. Newton). Tube expander.

- 8072 Waygood (J. E. Waygood). Marine engine governor.  
 8091 W. Milson. Anchor.  
 8139 J. Newton & D. A. Quiggin. Evaporating sea water.  
 8148 G. H. Lidbeck. Ships' bulwarks.  
 8171 L. Sellier. Propelling navigable vessels.  
 8174 Boulton (L. Josef). Furnace smoke consumer.  
 8175 Haddan (— Bailhache). Motor operated by waves.  
 8187 J. Hang. Quadruple expansion engines.  
 8195 R. Harnett. Drums for laying submarine cables.  
 8218 W. S. Baikie. Propelling boats.  
 8284 W. F. Bottomley. Preventing pitting of iron steam ships.  
 8321 J. G. Wilson. Bracket for holding tumblers for use on board ship.  
 8333 W. S. Bancroft & J. Horsfall. Corliss valve gears.  
 8340 J. I. Thorneycroft. Preventing or lessening rolling of vessels.  
 8348 W. J. Marshall & J. Ford. Fastening boiler tubes in their plates.  
 8351 C. F. Batt. Folding chair for use on steamers.  
 8354 D. Nicoll. Floatable ropes for life saving, etc.  
 8402 J. P. Lambing. Dredgers.  
 8412 J. W. Ward. Vessels' rams.  
 8418 G. W. Parker. Propulsion of small craft.  
 8425 G. O'Brien. Cleansing ships' bottoms.  
 8473 A. Brown. Quadruple expansion engines.  
 8484 R. H. N. Lindley. Expansion packing rings.  
 8518 T. Hughes. Protection of ships' bottoms.  
 8517 J. D. Churchill. Ventilating ships' cabins, etc.  
 8589 J. Henderson. Steam boiler furnaces.  
 8574 J. Wall. Marine signalling.  
 8711 B. Darbyshire & J. Entwisle. Furnace bridge for steam boilers.  
 8717 R. Patrick. Single crank engines.  
 8781 J. Milne. Signalling at sea.  
 8749 J. Cowley, F. & J. Lelen. Capstans.  
 8774 C. Wells. Steam and vapour engines.  
 8787 G. Jacob & J. H. Walker. Indicating ship's course.  
 8791 J. B. Dodds & J. R. Fothergill. Lessening corrosion in steam boilers.  
 8798 P. Oriolle Fils. Propulsion of vessels.  
 8810 R. Buck & S. Read. Vessel propellers.  
 8824 J. A. Fisher & J. C. S. McLay. Protecting ships' bottoms.  
 8878 R. Harnett. Raising sunken vessels.  
 8879 D. Ammen. Lifeboat.  
 8910 W. Walker, J. Sloan & E. W. Bell. Anti-fouling and anti-corrosive compositions.  
 8951 M. H. Tomkins. Marine ropes.  
 8991 E. Airey. Marine engine governor.  
 9080 R. & S. H. McKenzie. Anchoring boats.  
 9055 T. A. Harris. Valve.  
 9083 T. Nuttall. Mechanical stokers.  
 9085 T. Fisher. Preventing fouling on ships' bottoms.  
 9103 D. P. Menzies. Ventilating ships, etc.  
 9108 W. W. Codrington. Discovering sunken rocks.  
 9135 J. C. Wallace & M. P. Campbell. Reversing steam steering gear.  
 9156 T. Campbell. Withdrawing and replacing boiler tubes.  
 9205 M. J. Welch & J. J. McDonough. Non-eccentric valve gear.  
 9246 W. Bramley. Treatment of sea-water for marine boilers.  
 9251 J. A. Wilson. Towing ships.  
 9265 Boulton (the Pneumatic Steering Gear Manufacturing Co.). Steering gear.  
 9319 W. Dowland. Raising sunken ships.  
 9349 Tangyes (Limited), & E. Barnes. Pumping engines.  
 9386 T. & A. E. Penn. Propulsion of vessels.  
 9386 Thompson (F. W. Pool). Steam vessels.  
 9423 A. Clark. Navigable vessels.  
 9426 D. Joy. Regulating valve motions.  
 9430 A. D. Newell. Life-line carrier.  
 9463 J. H. Bell & W. Rockliffe. Sections of beams for ship-building.  
 9468 A. A. Rickaby. Plungers and pump rods.  
 9497 J. F. L. A. Larroque. Chain-cable.  
 9556 G. Tyzaek. Anchors.  
 9573 J. B. Dodds & J. R. Fothergill. Preventing or lessening corrosion in steam boilers.  
 9580 J. C. Ricketson. Speed indicator for engine shafts.  
 J. M. Cockburn. Dredging cranes and grabs.  
 Thompson (P. & V. Caillard). Steering gear.

- 9747 W. Balch. Letting go life-buoys.  
 9751 J. Orwin. Ships' davits.  
 9815 G. W. Hovgaard. Distilling sea water.  
 9848 H. Emanuel. Fixing centre-board wells.  
 9880 A. C. Moffatt. Feed water heaters.

## BOARD OF TRADE EXAMINATIONS.

NOTE.—1 C, denotes First Class; 2 C, Second Class.

May 25th, 1889.

- Arvaniter, J. . . 2C Liverpool  
 Buchanan, N. . . 1C Cardiff  
 Cooper, B. N. . . 2C N. Shields  
 Dempster, J. . . 2C Glasgow  
 Donaldson, T. McC. 2C "  
 Douglas, Dd. . . 1C "  
 Duncan, John. . . 1C "  
 Finlay, Dd. . . 2C "  
 Gardner, H. G. 2C London  
 Hake, Thos. . . 2C Cardiff  
 Hansen, J. E. . . 2C N. Shields  
 Hay, John . . 1C Glasgow  
 Hayes, C. W. . . 2C Cardiff  
 Hughes, H. G. 2C "  
 Jarren, G. . . 2C W. H'rtpl  
 Jenkins, Wm. R. 2C Cardiff  
 Lanigan, E. . . 1C Glasgow  
 Legg, J. T. . . 1C N. Shields  
 Lennard, Geo. . . 1C Cardiff  
 Mackenzie, T. A. 2C London  
 Macpherson, P. 1C Glasgow  
 McMurray, Dd. 2C "  
 Nesbitt, R. B. 2C Bristol  
 Parlance, Jas. . . 1C "  
 Patterson, H. G. 2C Cardiff  
 Poole, W. H. . . 2C "  
 Ramsay, R. . . 2C London  
 Rudd, John . . 2C N. Shields  
 Sumner, N. S. 1C Liverpool  
 Sweeting, J. J. 1C W. H'rtpl  
 Trussing, Wm. R. 1C "  
 Walker, A. . . 2C London  
 Waters, C. H. T. 1C W. H'rtpl  
 Williamson, J. 2C Glasgow

June 1st, 1889.

- Bradley, Wm. . . 1C Hull  
 Bullick, R. W. 2C Sunderland  
 Clark, Alex. . . 2C Liverpool  
 Dale, Wm. S. . . 1C Sunderland  
 Davie, Albert O. 1C "  
 Davies, John W. 1C Liverpool  
 Edgecombe, G. 2C Sunderland  
 Edwards, J. W. 1C Liverpool  
 Eyre, Thos. . . 2C Hull  
 Fairhead, W. A. 1C Sunderland  
 Geach, Wm. H. 1C Liverpool  
 Hamilton, Thos. 2C Sunderland  
 Ingram, Geo. . . 2C Hull  
 Jefferson, J. T. 1C Sunderland  
 Jones, John . . 2C Liverpool  
 Jones, J. R. W. 2C London  
 McCaskie, John 2C Hull  
 McManus, G. R. 1C Liverpool  
 Mills, Wm. . . 2C London  
 Murray, Jas. . . 2C Hull  
 Nesbitt, R. B. . . 2C Bristol  
 Owens, Robt. . . 1C Liverpool  
 Scott, Wm. T. 2C Sunderland  
 Thompson, F. 1C "  
 Walday, Tom E. 2C "  
 Whitfield, R. J. 1C N. Shields  
 Wilkinson, J. W. 1C Sunderland

June 8th, 1889.

- Anderson, Alex. 2C Glasgow  
 Barday, Andrew 2C "  
 Barrett, Wm. . . 1C Cardiff

- Bate, Wm. T. . . 1C Cardiff  
 Blaney, Albert E. 1C Liverpool  
 Bolton, John . . 2C Glasgow  
 Borrowman, A. R. 2C London  
 Cape, Jas. . . 1C Liverpool  
 Dixon, Jas. . . 2C N. Shields  
 Duncan, Wm. S. 2C London  
 Evans, Wm. Hy. 1C Liverpool  
 Flower, Chas. A. 1C Glasgow  
 Gates, Walter . . 2C Leith  
 Glanston, Jas. . . 1C Greenock  
 Howsavage, J. G. 2C N. Shields  
 Irving, Peter . . 1C Glasgow  
 Johnston, Jas. . . 2C London  
 Jones, Herbert E. 2C Cardiff  
 King, Walter . . 1C N. Shields  
 Lamb, Wm. H. 1C "  
 Lees, Chas. . . 1C Liverpool  
 Macdonald, W. J. 1C Glasgow  
 Milne, John . . 1C "  
 Mitchell, Alex. . . 1C Greenock  
 Mitchell, Wm. . . 2C Glasgow  
 Mollison, Benjn. 2C Leith  
 Morgan, R. F. . . 1C Cardiff  
 Morris, Wm. P. 2C Liverpool  
 Murray, Robt. . . 2C London  
 Newton, Thos. H. 2C N. Shields  
 Nichols, Chas. B. 1C Liverpool  
 Paterson, Edwin 2C Greenock  
 Pearce, Wm. Jno. 1C Cardiff  
 Pugh, Hugh . . 1C "  
 Sage, Wm. J. . . 1C London  
 Sargeant, J. B. 2C Cardiff  
 Sargent, J. Hy. 2C N. Shields  
 Saunders, Wm. 1C Cardiff  
 Smith, Wm. . . 2C Glasgow  
 Tait, Thos. . . 2C Greenock  
 Welch, Thos. H. 2C Liverpool  
 Webber, Jas. . . 2C London  
 White, Jas. C. . . 2C Glasgow  
 Wighton, Matt. 2C Leith  
 Williams, W. . . 2C Cardiff  
 Wilson, Robt. . . 1C Glasgow

June 15th, 1889.

- Alison, John . . 1C Leith  
 Brown, Hugh C. 1C Liverpool  
 Burnham, T. E. 2C "  
 Carruthers, Jas. 1C "  
 Cox, Jas. Thos. 1C N. Shields  
 Deason, Jos. L. 2C London  
 Garvell, T. G. . . 2C Hull  
 Gee, R. H. . . 1C Liverpool  
 Gibbons, H. J. R. 1C "  
 Graham, Wm. . . 2C N. Shields  
 Griffiths, L. T. 2C Liverpool  
 Haley, Alfred . . 1C N. Shields  
 Jones, G. E. . . 2C Liverpool  
 Laslett, A. E. . . 2C "  
 McGown, D. F. 2C Greenock  
 Morley, Robt. . . 2C Hull  
 Muirhead, J. T. 2C Leith  
 Mundy, Joseph 1C Hull  
 Roberts, H. W. 1C "  
 Sampson, Wm. 1C Liverpool  
 Shapter, Jas. . . 2C Plymouth  
 Sheppard, F. E. 2C London  
 Stokoe, Geo. C. 2C W. Hartp  
 Thomson, H. A. 1C London

# The Marine Engineer.

LONDON, AUGUST 1, 1889.

IT is to be noticed in our shipbuilding trade that there is a marked alteration in the general character of ships built than as heretofore; it would appear that steamships of large burden are tending to displace not only sailing vessels, but steam vessels of small tonnage. Thus our marine navy is less numerous than it was, but it grows in tonnage, in power, and in cost.

As a nation we are evidently making a bid for a distinct alteration in the character of our mercantile marine, and it will be somewhat interesting to discuss the idea as to whether such innovations are in a direction likely to maintain our prominence in the carriage of the world's goods, or whether it is founded upon misapprehension, and therefore likely soon to reduce a sudden check. On the one hand, the larger the vessel the more difficult it will be found to find full freights at any special port; we think, however, the increase in volume of international trade has so far increased in the last twenty years to permit an economical employment of very much larger steamers than hitherto, and such increase in volume of trade is likely to be well maintained. On the other hand, the cost of manufactures and running of steamships has of late increased, fuel is on the rise in value, and wages tend to increase in amount; here, again, the increase of speed of transit due to larger and faster vessels, the reduction of cost per ton due to the concentration of a large power in a single vessel rather than such power being divided over two or more smaller vessels, all tend to economy, sufficiently counter-balancing rising charges; one would, therefore, conclude that ship-owners are working in a right direction, engines of modern design being now so constructed as to work very expansively, and thus economically, and there being as yet no difficulty in finding freights concentrated at well-known ports for vessels of large tonnage. It is to be hoped, however, that under the new scheme of the Government for placing many new ironclads amongst the ship builders by private contract, a considerable access of work other than that for the mercantile marine, and reducing the capacity of the yards for merchant and passenger vessels, will do much to prevent over production for the mercantile marine, and a second check to the trade. It is

obvious that for the British Navy to hold their own, great attention must be paid to all points of economy that can be effected in order to counteract the cheaper rates of labour in the Scandinavian or German commercial marines.

THE battle between armour and projectiles still goes briskly on, the question of resistance of solid steel or compound armour faced with hard steel has lately been undergoing crucial tests. These tests were considered by some experts present to be considerably in the favour of the English compound or steel-faced plates; but Messrs. Schneider, representing solid steel plates, defended the action of solid steel as being superior to that of steel-faced iron, under certain conditions, depending upon the structure of the projectiles. The steel-faced plate has peculiar properties towards breaking up projectiles of medium quality, the faced plate being of extreme hardness breaks up the projectile, and thus almost entirely destroys its damaging effect upon the supporting iron backing. Projectiles, however, are now made, such as those of chrome steel, which will not break up on the surface of the hard plate, and can thus readily penetrate the soft backing. On the other hand, the steel backing is more likely to crack and fly than the wrought iron backing, and the requirements of our naval authorities have made the soft backing, such as that of wrought iron, an absolute necessity. If it can be proved that solid steel plates can now be manufactured so as to be free from injurious cracking and splintering, it is possible that our authorities may have gone too far in their opposition to solid steel. It is possible that compound steel plate could be produced, which, hardened on the outer face, would resist the impact of the projectiles, as well as the steel facing on iron compound plates, and being composed of steel throughout, would offer a considerably greater resistance to penetration than the soft iron backing of the English compound plates. On the other hand the entire want of homogeneity between the front and backing of a compound armour plate may serve better to prevent through cracking than can be effected by any plate of homogeneous metal. We might attain, therefore, further information of importance from experiments of the hardest projectiles, which are not likely to break on the steel-faced plate, and from noting the effect of such a projectile upon the back of a solid steel plate of the

mildest character, as compared with the wrought iron backing of the British compounded plate.

We have much regret in recording the death of Mr. Robert Duncan, the well-known Clyde shipbuilder. His father, Robert Duncan also, was a shipbuilder there, for a time in partnership with James Macmillan & Co., but latterly on his own account. The reputation of Mr. Duncan, senior, was such that in 1839 he was entrusted with the completion of the pioneer vessel of the Cunard Line, the *Britannia*. On the completion of his apprenticeship, the late Mr. Duncan went to sea for a short time, and afterwards became manager to Mr. James Macmillan, his father's former partner. In 1862 he began business on his own account in Port-Glasgow, in conjunction with two other partners, Messrs. Macgregor and Hamilton. In 1870, Mr. Duncan's two partners having retired, he was induced to become managing director of the Barrow Shipbuilding Co., then about to lay down extensive works in Barrow-in-Furness. But he finally resigned his post, and confined himself to carrying on his own establishment at Port-Glasgow. In 1883 he assumed as partners his three eldest sons, who since that date have conducted the business with great skill and success, having turned out 210,000 tons of shipping of all kinds and sizes up to 4,000 tons register. Mr. Duncan was elected by the Clyde Shipowners to represent them on the "Load Lines Committee" by the Board of Trade. He was born in Greenock, in 1827, being thus at his death in his sixty-second year, after an energetic and practically useful life.

### PASSENGER STEAMSHIPS OF BRITISH RAILWAY COMPANIES.

**N**OTWITHSTANDING the great progress that has been made within the last ten years, or thereabouts, in the steamship service of the above companies as regards the carriage of passengers; it is a subject of remark that no detailed account has been published on the question of this article.

This being so, and having been kindly supplied with particulars of these ships by direction of the leading officials of their owners, and our representative having inspected several steamers belonging to different railway companies, we will endeavour in the following statements to notify to our readers a short and connected account of the main facts relating to the passenger steamship service of British railway companies, and will be likely to be appreciated by them and the general

ly, as regards the Manchester, Sheffield and Lincoln-railway Company's ships, the routes taken by these are Grimsby to Hamburg, Rotterdam, and Antwerp. Five used in the Hamburg, two in the Rotterdam, Antwerp trades. The particulars of their departures are as under, viz.:—1. Hamburg trade: from

Grimsby on Tuesdays, Wednesdays, Thursdays and Saturdays; from Hamburg, Mondays, Tuesdays, Fridays and Saturdays, as early as possible after 7 p.m. 2. Rotterdam Trade: Wednesdays and Saturdays, as early as possible after 6 p.m., and from Rotterdam on Tuesdays and Saturdays as early as possible after 7 p.m. 3. Antwerp trade: from Grimsby, Wednesdays and Saturdays as early as possible after 6 p.m., and from Antwerp on Wednesdays and Saturdays, about 6 p.m.

Fast trains in connection with the steamers from Grimsby, leave Lincoln at 2 p.m., and Manchester at 8 p.m., arriving at Grimsby Docks at 6 p.m. The steamers wait for these trains, and depart as soon afterwards as tide will permit.

The following Table I. gives the names, dimensions, tonnage, particulars of the engines, speed, and by whom, and the dates on which the steamers and engines were made.

The next Table gives an account of the passenger accommodation of the last mentioned steamers, as under:—

Names	Passenger Accommodation			Smoking Room	Promenade Accommodation	
	Saloon	Second Class	Deck		Deck	Sq. Ft.
S.S. Ashton	31	10	263	One	Poop & Bridge	1768
" Bradford	26	Nil	185	None	do.	1900
" Chester	31	10	275	One	do.	1768
" Hudders'ld	37	Nil	143	One	Bridge	1440
" Lincoln	48	Nil	288	One	Poop	1700
" Northenden	47	Nil	232	One	do.	1610
" Oldham	49	Nil	200	One	do.	1550
" Retford	36	12	246	One	Poop & Bridge	2400
" Sheffield	40	Nil	152	None	Poop	1400
" Warrington	47	Nil	232	One	do.	1610

Each steamer carries a Steward and Stewardess, and there is a Ladies' Cabin in each vessel.

The Saloon is found by the captain of the ship at reasonable prices.

The South Eastern Railway Company own a very good service of steamers which run from Folkestone to Boulogne, and have a good train service, including some excellent "expresses" in connection with these steamers. The following Table III. contains a list of such, and other essential particulars concerning them.

The three leading passenger steamers of the South Eastern Railway Co. are the *Albert Victor*, *Louise Dagmar*, and the *Mary Beatrice*, the two former being built in 1880, and the last in 1882. They are all of the same type, and have a speed of 17 knots an hour. The s.s. *Mary Beatrice*, which our representative inspected, is an excellent boat for the Channel service.

The main deck affords good sheltered space for promenade. The aft part for first-class and the forward for second-class passengers. There are also several private cabins, well furnished, lighted, and ventilated, on this deck for the use of first-class passengers at an extra charge, and which are in great demand. There is a promenade deck above the main deck for the use of first-class passengers, which extends from the stern to the fore part of the paddle-box. There is also a fore top on the level with this deck in the forward part of the steamer for the use of second-class passengers. The first-class saloon is on the main deck, and is a very spacious apartment. The panels at the sides contain water-colour drawings and artistically carved floral decorations. The ceiling is white, relieved with gold. The settees and couches are upholstered in red rep, and the floor is covered with oil cloth. This saloon is remarkably well lighted by railway carriage windows at either side. In bad weather they are protected by shutters. Beyond the ventilation from the windows, an appreciable amount of this can be obtained from perforated plate openings at the sides. There is also a refreshment bar within this saloon for the use of first and second class passengers. The latter, however, are not allowed to stay longer than is necessary for the consumption of the refreshment served to them. The dining saloon for first-class passengers is entered from the main saloon, and is on the lower deck, where there are berths for thirty persons. The sides and ends of this enclosure are panelled in white and gold. The seats are upholstered in red rep. One private cabin also communicates with this saloon. There is also a small refreshment bar connected with this room; it is lighted and ventilated from port holes and perforated plates. On the passengers embarking a cold collation is found on the table of

TABLE I.

Names	Dimensions			Tonnage.		Engines			Estimate of Speed	Speed usually driven from port to port	Built		Engined		
	Length	Breadth	Depth	Gross.	Net	Cylinders	Diameter	H.P.			By	Date	By	Date	
S.S. Ashton	238-6	32-3	14-1	1007	650	3	22-37-58"	36	170	12 knots	12 knots	E. Withy & Co., W. Hartlepool	1884	T. Richardson & Son, W. Hartlepool	1884
" Bradford	205-2	24-4	12-0	468	293	2	27-50"	30	97	11 "	11 "	A. & J. Inglis, Glasgow	1865	A. & J. Inglis, Glasgow	1865
" Chester	238-6	32-2	14-1	1010	652	3	22-37-58"	36	170	12 "	12 "	E. Withy & Co., W. Hartlepool	1884	T. Richardson & Son, W. Hartlepool	1884
" Huddersf'd	231-0	30-2	16-4	1082	681	2	30-3-57"	36	120	11 "	11 "	J. Elder & Co., Glasgow	1872	T. Richardson & Son, W. Hartlepool	1872
" Lincoln	251-5	32-2	15-9	1075	697	2	36-69"	89	185	12 "	12 "	Earles' Co., Hull	1883	J. Elder & Co., Glasgow	1883
" Northenden	230-0	30-1	14-6	843	414	3	21-1-35-57"	32	170	12 "	12 "	Swan & Hunter, Newcastle	1886	Earles' Co., Hull	1886
" Oldham	240-4	30-0	16-0	841	412	3	22-35-57"	42	170	12 "	12 "	Earles' Co., Hull	1889	Walsend Slipway Co., Newcastle	1889
" Retford	230-6	32-0	13-9	951	612	4	23-43"	27	140	12 "	12 "	Earles' Co., Hull	1883	Earles' Co., Hull	1883
" Sheffield	201-0	27-1	15-1	644	407	2	28-50"	30	90	11 "	11 "	J. Elder & Co., Glasgow	1877	J. Elder & Co., Glasgow	1877
" Warrington	230-0	30-1	14-6	840	412	3	22-35-57"	42	170	12 "	12 "	Swan & Hunter, Newcastle	1886	Wesgarth & English, Middlesboro'	1886

TABLE III.

	<i>Albert Victor.</i>	<i>Louise Dagmar.</i>	<i>Mary Beatrice.</i>	<i>Albert Edward.</i>	<i>Victoria.</i>	<i>Folkestone.</i>	<i>Boulogne.</i>	<i>C. W. Elborall.</i>	<i>Achille Adam.</i>	<i>Jubilee Steam Life Ship No. 1.</i>
Where and when Built	Poplar 1880.	Poplar 1880.	Poplar 1882.	Poplar 1862.	Poplar 1861.	Hull 1878.	Hull 1878.	Hull 1883.	Poplar 1887.	Poplar 1887.
Length over all	260 feet.	260 feet.	215 feet.	215 feet.	210 feet.	200 feet.	191 feet 9 in.	200 feet.	200 feet.	123 feet.
Extreme Breadth	55 feet 5 in.	55 feet 5 in.	44 feet 9 in.	44 feet 9 in.	44 feet 9 in.	25 feet.	25 feet.	25 feet.	27 feet.	20 feet.
Moulded Breadth	29 feet.	29 feet.	24 feet.	24 feet.	24 feet.	25 feet.	24 feet 10 in.	25 feet.	27 feet.	20 feet.
Average speed Port to Port	17 knots.	17 knots.	15 knots.	15 knots.	15 knots.	12 knots.	12 knots.	12 knots.	12 knots.	12 knots.
Description of Engines	Direct Oscillating. Penn & Son.	Direct Oscillating. Penn & Son.	Oscillating. Penn & Son.	Oscillating. Penn & Son.	Oscillating. Penn & Son.	Twin Screw direct acting Compound. Earle's Shipbuilding Company, Hull.	Twin Screw direct acting Compound. Earle's Shipbuilding Company, Hull.	Twin Screw direct acting Compound. Earle's Shipbuilding Company, Hull.	Twin Screw direct acting Compound. Maudslay Sons & Field. Circular. Maudslay.	Single Screw direct acting Compound. Young & Son, Blackwall. Circular. Young & Son.
By whom made	Penn & Son.	Penn & Son.	Penn & Son.	Penn & Son.	Penn & Son.	Penn & Son.	Penn & Son.	Penn & Son.	Penn & Son.	Penn & Son.
Description of Boilers	Rectangular. Penn.	Rectangular. Penn.	Rectangular. Penn.	Rectangular. Penn.	Rectangular. Penn.	Circular. Earle's Shipbuilding Company, Hull.	Circular. Earle's Shipbuilding Company, Hull.	Circular. Earle's Shipbuilding Company, Hull.	Circular. Earle's Shipbuilding Company, Hull.	Circular. Earle's Shipbuilding Company, Hull.
By whom made	Penn.	Penn.	Penn.	Penn.	Penn.	Penn.	Penn.	Penn.	Penn.	Penn.
Working pressure	30 lbs.	30 lbs.	30 lbs.	30 lbs.	30 lbs.	80 to 90 lbs.	80 to 90 lbs.	80 to 90 lbs.	80 to 90 lbs.	80 to 90 lbs.
Passenger Accommodation	586.	590.	624.	367.	354.	133.	133.	133.	133.	Nil.
Trains in Connection with which they run	10.0 a.m. Boat Express London and Paris.	10.0 a.m. Boat Express London and Paris.	10.0 a.m. Boat Express London and Paris.	Special Traffic.	Special Traffic.	Night Service Trains between London and Paris, and Merchandise Traffic.	Night Service Trains between London and Paris, and Merchandise Traffic.	Night Service Trains between London and Paris, and Merchandise Traffic.	Night Service Trains between London and Paris, and Merchandise Traffic.	Miscellaneous Traffic.

this saloon, but which is removed before the passengers lie down.

There is also a large ladies' cabin on a level with and close to this saloon, and which communicates with the main saloon by stairs. This cabin is well decorated, and upholstered in blue velvet. It is properly lighted and ventilated by port holes. Other means of ventilation also exists from perforated pipes. There are good lavatories in connection with both of these rooms.

The second-class passengers' saloon is also on the lower deck. There is a second-class ladies' cabin adjoining. Both are convenient and spacious, and contain lying-down berths. They are well furnished, and are ventilated from port holes and perforated plate openings. The captain's and first officer's cabins are entered from the second-class saloon. The other officers' and seamen's quarters are situate in the fore-part of the lower deck. There is an excellent smoking room for first-class passengers, and private cabins on the main deck. Arrangements are made for the carriage of about thirty horses under the fore-top, and the South Eastern Railway Co. transport a great number in their boats between Folkestone and Boulogne. All their steamers on this route are provided with first-class steam steering gear and machinery for working cargo, and life-saving apparatus. The stoke holes are also well ventilated from cowls.

On all voyages cold collations are provided for the passengers at moderate charges, but tea and coffee and other hot beverages can always be obtained.

The steamships of the London and South-Western Railway Co., which run between Southampton and the Channel Islands, between Southampton and Havre, and from and to the former place and St. Malo and Cherbourg, are used by an immense number of passengers.

The following table gives their names, dimensions, tonnage, nominal horse-power, and number of passengers for which they have accommodation:—

Name of Steamer	Dimensions			Gross Regist'd Tonnage	Nominal Horse Power	No. of Passengers
	Length	Breadth	Depth of Hold			
Alderney	175	25 $\frac{2}{10}$	19 $\frac{2}{10}$	611-71	90 Sc.	159
Alliance	175 $\frac{2}{10}$	23 $\frac{2}{10}$	14 $\frac{2}{10}$	386-82	130 Pad.	363
Brittany	236	25 $\frac{2}{10}$	13	624-93	230 Pad.	523
Cherbourg	165 $\frac{2}{10}$	23 $\frac{2}{10}$	11 $\frac{2}{10}$	372-92	65 Sc.	121
Diana	232 $\frac{2}{10}$	28 $\frac{2}{10}$	14 $\frac{2}{10}$	723-49	210 Sc.	565
Dora	240	30	14 $\frac{2}{10}$	741-23	220 Sc.	519
Ella	235 $\frac{2}{10}$	29 $\frac{2}{10}$	14 $\frac{2}{10}$	797-13	220 Sc.	569
Fannie	231 $\frac{2}{10}$	26 $\frac{2}{10}$	13 $\frac{2}{10}$	615-86	250 Pad.	576
Griffin	155	20 $\frac{2}{10}$	11 $\frac{2}{10}$	272-43	70 Sc.	198
Guernsey	195 $\frac{2}{10}$	26	13 $\frac{2}{10}$	520-81	150 Sc.	381
Hilda	235 $\frac{2}{10}$	29 $\frac{2}{10}$	14 $\frac{2}{10}$	796-30	220 Sc.	576
Honfleur	176 $\frac{2}{10}$	24 $\frac{2}{10}$	12 $\frac{2}{10}$	397-52	125 Sc.	278
Laura	207	26 $\frac{2}{10}$	13 $\frac{2}{10}$	595-04	180 Sc.	376
Maria	155 $\frac{2}{10}$	21 $\frac{2}{10}$	11	260-84	50 Sc.	107
St. Malo	161	22 $\frac{2}{10}$	12 $\frac{2}{10}$	304-28	90 Sc.	227
Southampton	236 $\frac{2}{10}$	25 $\frac{2}{10}$	12 $\frac{2}{10}$	585-48	200 Pad.	525
South Western	222 $\frac{2}{10}$	27 $\frac{2}{10}$	13 $\frac{2}{10}$	638-74	180 Sc.	506
Wolf	242 $\frac{2}{10}$	27 $\frac{2}{10}$	13 $\frac{2}{10}$	731-53	310 Pad.	492

The *Ella*, one of the screw steamers of the Company, used in the Channel Islands service, is a fair type of the other ships run on this route. One of our representatives was, with the kind permission of the Marine Superintendent of the Company, shown the arrangements of this boat.

It contains a convenient quarter-deck and bridge-deck, for the use of first-class passengers only. There are four covered seats aft on the former deck for ladies only. There are three private cabins for families, etc., on the quarter-deck, which can be secured on the payment of the first-class fare for the total number of berths in each cabin. These compartments are very luxuriously decorated and furnished. The sides are elegantly panelled with bird's-eye maple; the ceiling is white relieved with gold. In the larger one is a white embossed glass skylight, which opens in fair weather. At either side there are embossed glass windows, provided with fine green silk blinds fringed with gold. The seats are covered with red velvet, and the floor well carpeted. There is an electric bell communication with the steward from the compartment. This and the other private cabins are heated by a steam pipe at the foot of the seats, protected by a copper guard; there is good lavatory accommodation connected with them.

On the bridge-deck for the promenade of first-class passengers there are fixed deck seats. The captain's cabin and wheel-house are on this deck; so also are the life-boats, life rafts and ventilators for the engine rooms and stoke holes. The raised forecastle deck is used by the second-class passengers.

The first-class saloon of this steamer occupies the full width of the ship and is more spacious than several of the oceanic mail steamers that made long distance voyages a few years ago. The sides are tastefully embellished. They are panelled in with bird's-eye maple containing figure decoration, and are relieved with black and gold ornamentation, the ceiling is white, relieved with gold. There are three tables in the middle of the saloon, which can be joined together, as they often are, to form one long table. The moveable settees for those using the table and the couches and berths in this enclosure are upholstered in rich red velvet. The saloon is well lighted by an excellent skylight. It is heated by steam pipes at the foot of the couches or berths, protected by a perforated copper covering. The ventilation of the compartment is also efficient, as it can be effected by perforated apertures from metallic plates in the floor as well as from port holes at the sides and the end. The ventilation from the floor, which is very appreciable in bad weather when the port-hole windows cannot be opened, results from cowls fixed on the quarter-deck.

Adjacent to this saloon there is also a ladies' cabin. This is also elegantly furnished and decorated, lighted, heated, and ventilated in a similar manner to the saloon. There is good lavatory accommodation in connection with this cabin.

On the lower deck there is a first-class sleeping cabin for gentlemen, containing about 40 sleeping berths, some of which, as in ocean steamers, are in comfortable recesses. The cabin is furnished, and decorated and otherwise made comfortable as the first-class saloon. A good lavatory adjoins the cabin.

In the fore part of the lower deck good accommodation is afforded to second-class passengers by a large, spacious saloon which is utilised for lying down. It contains numerous sleeping berths, and is well furnished and decorated for a compartment of this class for cross-channel service. Its hygienic arrangements for warmth and ventilation are equal to those of the first-class cabin, and it is also well-lighted.

The second-class ladies' cabin near the former is substantially similar in its accommodation; good lavatory conveniences have been provided for the passengers of each cabin.

The *cuisine* in this and other steamers of the London and South Western Railway Co. are all that can be desired, and have been much appreciated by passengers. All the ships carry well-trained stewards and stewardesses.

There is good steam steering-gear on the bridge deck, and hand steering-gear at the stern and on the bridge deck. For working the cargo there are three steam winches, two forward and one aft, and a donkey engine below for this purpose. The *Ella* is well provided with life-saving apparatus far beyond all legislative requirements.

In addition to carrying several ordinary and two collapsible life boats, she has many life rafts and life buoys. The *Ella*, *Hilda* and *Diana*, used in the Channel Islands service, are sister ships, and are fitted exactly alike. The *Dora*, also used in this service, being a newer steamer, has a few further improvements. She is built by Napier & Co., of Govan, and has triple-expansion engines. She is also installed throughout with the electric light. In the first-class saloon there areopal globes which give an excellent and subdued light.

All the steamers used in the Channel Islands service are propelled by screws, except the *Brittany*, which is a paddle boat. These ships in good weather make their voyages between Southampton and Jersey in 10 hours, and between the former port and Guernsey in about two hours less.

On their route between Southampton and Havre the company run the *Wolf*, *Southampton*, and *Fannie*, which generally make the passage in about eight hours in good weather.

At a little less speed the company have also a direct service of steamers running between Southampton and St. Malo. These ships are the *South-Western*, *Laura*, and *Guernsey*. Between Southampton and Cherbourg, and between Jersey and St. Malo, and Jersey and Granville, there are other steamship routes run by the London and South-Western Railway Co.

The quickest and best routes to the Channel Islands and Granville are by the steamers of this company. The steamers for the Channel Islands which carry the mails leave Southampton docks for Guernsey and Jersey on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays at midnight, and also on

Saturdays at 10.30 p.m. for Jersey direct. The same steamers leave Jersey daily, except Sundays, at 7.30 a.m., and call at Guernsey about two hours afterwards. The last train in connection with the outward steamers leaves Waterloo Station, London, on the first five days of the week at 9.45, and on Saturday evenings at 7.45. Passengers, however, may go by any previous train. For the conveyance of passengers to London a train leaves Southampton for the latter as soon as possible after the arrival of the steamer in Southampton. Passengers for the mail steamers going from London by the last trains from Waterloo Station in connection with them are conveyed through in the railway carriage into the Southampton Docks alongside the steamers, and their luggage is placed on board without any trouble or additional expense. For the convenience of passengers going through to London *via* Southampton, railway carriages are provided in the docks to carry passengers and their luggage to the railway station free of expense.

On the route between Southampton and Havre, steamers leave the former port every Monday, Wednesday, Friday, and Saturday at midnight. The last trains from London in connection with these ships leave at 9.45 p.m., except on Saturdays, when they leave at 7.45. The average time for the steamers crossing the Channel is about six-and-a-half hours and about two more hours on the river. Trains leave Havre for Rouen and Paris, first-class, at 12.23 midday, and second-class at 9.28 a.m. and 12.28 midday. The trains arrive at Paris, first-class, at 4.35 p.m., and second-class at 3.55 and 7.25 p.m. On the return voyages a steamer leaves Havre every Monday, Wednesday, Friday and Saturday at 9 p.m., and the train in

connection with it leaves Southampton for London at 6.50 a.m., and on Sundays at 6.45. The latest trains for these ships leave St. Lazare station, Paris, as follows: First-class at 1 p.m., and second-class 12.30 midday, but passengers may travel by any previous train.

The sailings of the companies' steamers between Southampton and St. Malo on Mondays, Wednesdays, and Fridays, and between Jersey and St. Malo, and Jersey to Granville, vary in their times of starting from these ports. Steamers with passengers and merchandise also proceed from Southampton to Cherbourg, every Tuesday, Thursday, and Saturday night at 10.30. The last train leaves Waterloo station for London in connection with these steamers on Tuesdays and Thursdays at 7.35 p.m. and on Saturdays at 7.45 p.m. Passengers can, however, go by previous trains. The return voyages from Cherbourg on Monday, Wednesday, and Friday nights vary in their times of departure.

The number of passengers carried by the steamers of the company, and especially in the summer and autumn months, in their several routes is immense. These ships have been specially made for encountering rough weather, and are eligible to be used for service on any sea.

The steamship service of the London, Chatham and Dover Railway Co. between Dover and Calais is an excellent one. This route is not only the shortest between England and France, but the average passage on it is nearly half-an-hour less than any other route between England and the Continent. The undermentioned Table gives an account of the steamers belonging to the company before 1886, viz.:—

Ship's Name.	Dimensions			Tonnage per Register	Passenger Accommodation	Nature of Engines	Description of Boilers.	Working Pressure	Horse Power	Average Speed	When Built
	Length over all	B'r'dth	Depth Moulded								
Foam	230.6	26.6	14.6	302	500 1st and 2nd Class	Oscillating	Tubular	25	240 nom.	15	1862-3
Petrel	do.	do.	do.	do.	do.	do.	do.	do.	do.	do.	1862
Maid of Kent	196	24.6	12.10	174	339	do.	do.	23	160	do.	do.
Sapphire	do.	do.	do.	166	329	do.	do.	do.	do.	do.	do.
Breeze	198	24.8½	12	179	339	do.	do.	25	do.	14½	1863
Wave	do.	24.8½	do.	181	do.	do.	do.	do.	do.	14	do.
Prince	206	24	12.6	179	400	do.	do.	do.	190	14 to 15	1864
France	do.	do.	do.	180	do.	Oscillating	do.	do.	do.	do.	do.
Calais-Douvres	302	61	18.9	559	1000	Inclined Direct Acting	Circular	23	600	13	1878
Twin Steamer											
Invicta	312	33.6	16.9	552	931	Diagonal Oscillating	Box Boilers Return Tubes	30	4900 indicated	15.6	1882

The *Victoria*, *Empress*, and new *Calais Douvres*, built in 1885, 1887, and 1889, respectively, by the Fairfield Shipbuilding and Engineering Co., are sister ships and are almost exactly alike, except that the engines of the *Calais Douvres* indicate about 6,000 and the two former about 5,000 H.P. The particulars of their dimensions, tonnage and engines are as follows, viz.:—*Victoria*, length, 309 ft. 4 in.; width, 34 ft. 1 in.; depth, 12 ft. 8 in.; net tonnage, 252; engines, 2 cylinders, 58 in. and 104 in. *Empress*, length, 324 ft. 6 in.; width, 34 ft. 9 in.; depth, 13 ft. 5 in.; net tonnage, 151; engines, 2 cylinders, 58 in. and 104 in. *Calais Douvres*, length, 325 ft. 5-10 in.; width, 35 ft. 9½ in.; depth, 13½ in.; net tonnage, 181½; engines, two cylinders, 59 in. and 106 in. The speed of the *Victoria* and *Empress* are about 19, and of the *Calais Douvres* about 19½ knots per hour. These three steamers are by far the fastest that run across the Channel, and are very much appreciated on this account.

The last mentioned of these ships is a splendid specimen of a first-class type of fast paddle steamers. She has a spar or promenade deck for first-class passengers, which much excels several leading ocean steamships for this purpose. This deck extends the full length and breadth of the ship, and is well appreciated by passengers in good weather. Lounge chairs are frequently used upon the deck. There are fixed covered seats upon it for ladies. Under this there is an excellent covered main deck, the greater part of which is used by first-class passengers. This also affords a good promenade in bad weather, from which it is efficiently protected. A superabundance of

life-saving apparatus is kept on the spar and main decks consisting of boats, life rafts, buoyant cushions, and life belts, etc. There is a splendid navigation bridge from the promenade deck with telegraphic communication to either end of the steamer and to the engine room.

There are several private cabins on the main deck, luxuriously furnished, and with all conveniences. These are let off at various charges, and there is a great demand for them. A large and luxuriously furnished smoking cabin is also situate on the main deck. Comfortable officers' quarters are provided at the fore part of the steamer.

The first-class saloon and first-class ladies' cabin, on the lower deck, are very artistically and most luxuriously furnished and decorated, and are well lighted and ventilated. This cabin and the one on the same deck for ladies travelling second class are provided with comfortable lying down berths, and have excellent lavatory accommodation connected with them. The first-class saloon and first-class ladies' cabins are upholstered in rich velvet, and the sides are elaborately and very tastefully panelled in white and gold. The ceiling is also equally well decorated, so that they appear very gorgeous apartments.

There is a large refreshment buffet aft with tables and seats for first-class passengers. The decorations, upholstery, furniture, and fittings of this room present a very luxurious and ornate aspect. Cold meat, poultry, fish, and pastry are to be obtained on board, and hot and cold beverages of the best quality.

Both the *Calais-Douvres* and the *Invicta*, *Victoria* and

*Empress* are lit up with electricity throughout, and are provided with electric bell communication. They are fitted with very powerful electric lamps on the bridge and on the spar deck for embarking and landing passengers.

There are four express trains running daily, except Sundays, by the London, Chatham & Dover Co. in connection with the fast boats from Dover to Calais, and *vice versa*. The approximate hours for the run to Paris from Victoria Station, London, are 8½, by the 8.40 a.m. and 8.40 p.m. trains; 8 hours by the 11.0 a.m. train, and only 7½ hours by the first-class limited express, or Club train, which starts at 4.15 p.m. The journey from Paris to London is made from the Paris Mid-Station in 8½ hours by the 8.22 a.m. train; 8 hours by the 11.15 a.m. train; 7½ hours by the limited first-class express, or Club train, starting at 4.0 p.m.; and 9½ hours by the night mail, which leaves 8.40 p.m. The limited mail does not leave London on Sundays, nor Paris on Saturdays, and on a few days in the month it leaves London at 2 p.m. and Paris at 2.40 p.m. as advertised, instead of 4.15 p.m. and 4 p.m. respectively. Many passages have been made between Dover and Calais by the faster steamers on this route, which carry the Royal mails in 65 minutes, while the *Calais-Douvres* can perform the distance in even a less time.

To Mr. William Forbes, the continental manager, the credit is due for originating the limited first-class express or Club service. This consists of two long green saloon cars, belonging to the International Sleeping Car Co. The charge per passenger for riding in this train is 16s. beyond the first-class fare. A luggage van, for the conveyance and examination of luggage between Dover and London, is attached to the train. Between Calais and Paris the train is composed of saloon and dining cars, recently constructed for this service. Table-d'hôte dinners are served from 7.30 p.m. on leaving Calais at seven francs per head; and the examination of baggage takes place in the train. In consequence of this the passengers are able to reach their hotels without the tedious waiting at the termini for the Customs examination of their luggage, and which is now so uncomfortable. Between Paris and Calais on the night mails a toilet bed carriage runs, with two compartments of three places each. Fifteen francs extra are charged for this accommodation on each first-class fare. Private cabins are especially reserved for visitors to the "Lord Warden" Hotel at Dover, which can be booked in advance by applying to the proprietor, and the most comfortable seats secured on board the steamers. By the express day and night mail services *via* Calais all luggage registered to Victoria Station from the Continent is examined at Victoria, except on Sundays. Luggage registered to St. Paul's or Holborn Viaduct Station is examined at Dover. The morning mail now leaving Victoria at 8.40 is 40 minutes faster than last year, by means of the introduction into this service of the London, Chatham, and Dover steamer *Invicta*. The 11 a.m. service of trains from Victoria Station is 25 minutes faster than last year, and it now reaches Paris at 7.15 p.m. The night mail is also considerably accelerated, as a saving of 50 minutes has been made in the running since last year. As speed is the essence of importance in passenger voyages, the London, Chatham, and Dover Railway Co. are entitled to much commendation for running the fastest ships in the world between this country and the Continent.

(To be concluded in our next No.)

## INSTITUTE OF MARINE ENGINEERS.

A MEETING of the above Institute was held on Monday evening, May 27th last, when a paper was read by Mr. G. W. Manuel, R.N.R., M.I.N.A., (Superintendent Engineer P. & O. S. N. Co.) on "Crank and Screw Shafts of the Mercantile Marine," illustrated by diagrams.

The chair was taken by J. M'Farlane Gray, Esq., Chief Examiner Board of Trade, who introduced the author of the paper as the Superintendent of the largest Steam Ship Co. in the world.

Mr. Manuel then read his paper as follows:—

### CRANK AND SCREW SHAFTS OF THE MERCANTILE MARINE.

MR. CHAIRMAN AND GENTLEMEN,—When asked to read a Paper before your Institute, I chose this subject, for I think there is no part of the marine engine has given so much trouble and anxiety to the sea-going engineers, and from the list of casualties in the daily papers amongst shipping it seems in many cases to be so still, causing loss to the shipowner and in some instances danger to the lives of the crew.

My endeavour is to put some of the causes of these casualties before you, also some of the remedies that have tended to reduce their number in a simple manner.

Several papers have been read on this subject, chiefly of a theoretical description dealing with the calculations relating to the twisting and bending movements, effects of the angles of the cranks, and length of stroke, notably that read by Mr. Milton before the Institute of Naval Architects in 1881. The only practical part of this paper dealt with the possibility of the shafts "getting out of line," and regarding this contingency Dr. Kirk, in the discussion which followed, said that if superintendent engineers would only see that the bearings were kept in line, broken crank and other shafts would not be so much heard of.

Of course this is one of those statements made in discussions of this kind, for what purpose I fail to see, and as far as my own experience goes is misleading; for, having taken charge of steamers new from the builder's hands, when it is at least expected that those shafts would be in line, the crank shaft bearings heated very considerably and continued to do so, rendering the duration and efficiency of the crank shaft a short one, and though they were never what is termed out of line, the bearings could not be kept cool without the use of sea water, and occasionally the engines had to be stopped to cool and smooth up the bearing surfaces, causing delays, worry and anxiety, for which the engineer in charge was in no way responsible.

Happily this state of what I might call *uncertainties* is being gradually remedied, thanks being largely due to those engineers who have the skill to suggest improvements, and the patience to carry them out against much opposition.

These improvements in many instances pertain to the engine builders' duties, and are questions which I think have been treated lightly, notably that of insufficient bearing surface, one of the principal causes of hot bearings, whereby the oil intended for lubrication was squeezed out, and the metal surfaces brought too close in contact, and where bearings had a pressure of 210 lbs. per square inch, it has been found that not more than 110 lbs. per square inch should be exerted to keep them cool (this varies according to the material of which the bearing is composed) without having to use sea water and prevent them being ground down and thus getting out of line.

I have known a bearing in a new steamer, in spite of many gallons of oil wasted on it, wear down one-eighth of an inch in a voyage of only 6,000 miles, from insufficiency of bearing surface.

Several good rules are in use governing the strength of shafts which treat of the diameter of the bearings only, and the engine builder, along with the shipowner, has been chary of increasing the surfaces by lengthening the bearings, which means increase of space in the direction of fore-and-aft the vessel, besides additional weight of the engine. In these days of strong competition engine builders offer to put their engines in less space than their rivals, of equal power, and in some cases more.

I think now inducements of this nature are more carefully considered, it being found more profitable to give larger surface to the crank-shaft bearings than to have steamers lying in a foreign port fitting a spare shaft, with the usual heavy bills for salvage and repair, and it may be the loss of the steamer in bad weather, with the lives on board.

Proportioning the bearings to the weights and strains they have to carry, has also been an improvement, the different bearings of marine engines were usually made alike in surface, irrespective of the work each had to do, with a view to economy in construction. The modern practice is to give the after bearings more surface than the forward, except in cases where heavy slide valve gear has to be supported, so that the wear down in the whole length of shaft is equal, thus avoiding those alternate bending strains at top and bottom of the stroke every revolution.

Another improvement that has been successfully introduced, adding to the duration of life in crank-shafts, is the use of white bearing metal, such as Parson's white brass, on which the shafts run smoothly with less friction and tendency to heat, so that along with well-proportioned surfaces a number of crank-shafts in the Peninsular & Oriental Co.'s service have not required lining up for eight years, and I hope with care may last till new boilers are required.

Large and powerful steamers can be driven full speed from London to Australia and back without having any water on the bearings, using oil of only what is considered a moderate price, allowing the engineer in charge to attend to the economical working of both engines and boilers (as well as many other

engines and machines of various kinds now placed on board a large mail and passenger steamer) instead of getting many a drenching with sea water and worried by close attendance to one or two hot bearings all the watch. Compare these results with the following in this same service in 1864, and with no blame to the engineers in charge, the crank-shaft bearings of a screw-steamer had to be lined up every five days at intermediate ports through *insufficient* bearing surfaces, sea water had continually to be used, resulting in frequent renewal of crank-shaft.

Figs. 1 & 2 show the design of the old and new main bearings, and I think require but little explanation. Most of you present will remember your feelings when after a hot bearing the brasses were found to be cracked at top and bottom, and the trouble you had afterwards to keep these brasses in position.

The heating of a crank-pin or main bearing next the crank has the effect of *damaging* the material of the shaft more or less according to its original soundness, generally at the fillets in the angles of the cranks. For when the outer surface of the

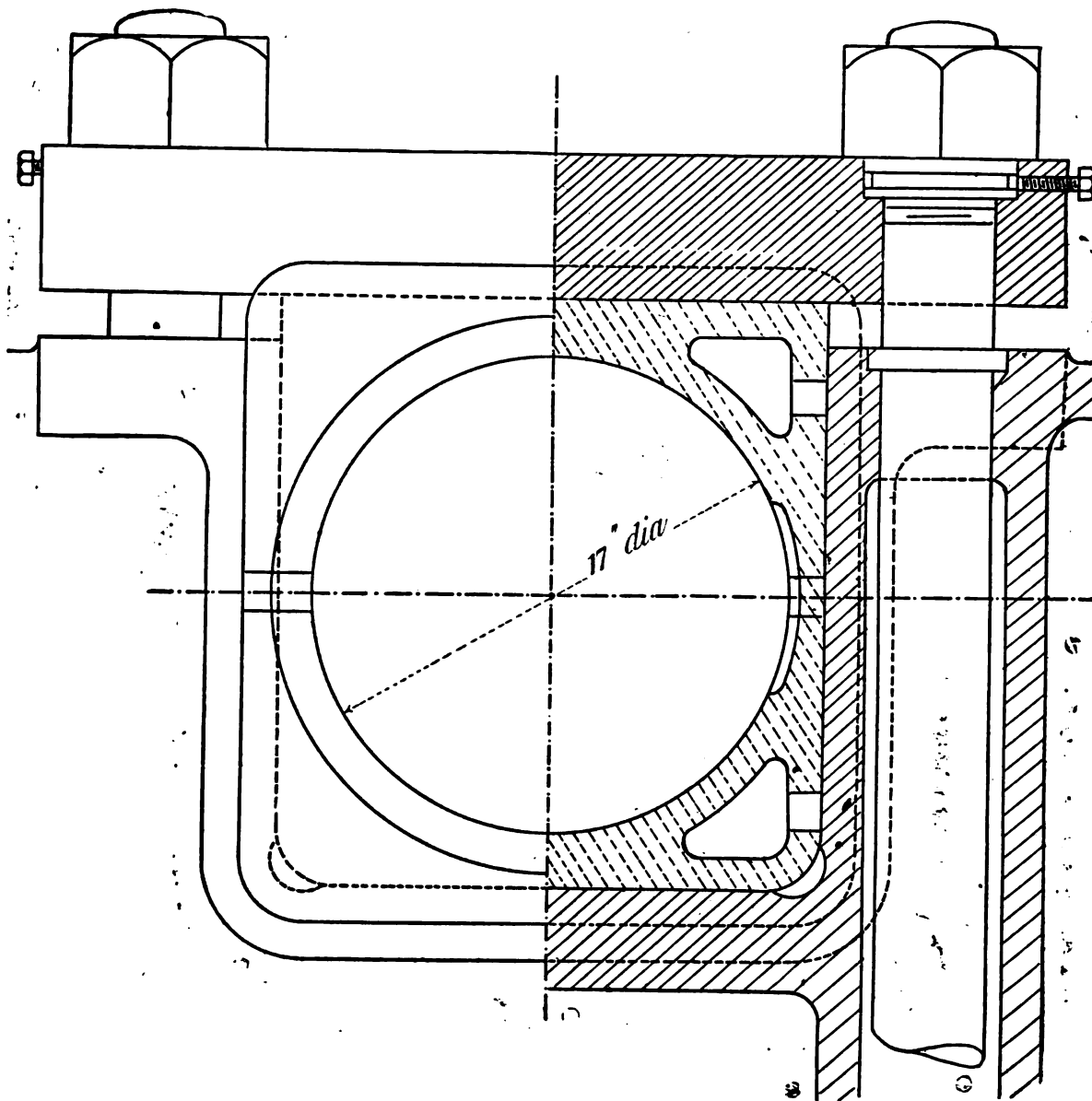


FIG. 1.

Steamers can now run 25,000 miles without having to lift a bearing except for examination at the end of the voyage.

I would note here that the *forms* of the bearings on which the shafts work has also been much improved, they are made more of a *solid character*, the metal being more equally disposed round the shaft, and the use of gunmetal for the main bearings is now fast disappearing; in large engines, the only metals used are cast-iron and white brass, an advantage also in reducing the amount of wear on the recess by corrosion and grinding where sea-water was used often to a considerable extent.

iron got hot, cold water often of a low temperature was suddenly poured on, and the hot iron previously expanded was suddenly contracted, setting up strains which, in my opinion, made a *small tear* at the surface transversely where the metal was *solid*, and where what is termed lamination flaws due to construction existed then, were extended in their natural direction, and by a repetition of this treatment these flaws became of such a serious character that the shafts had to be condemned or actually gave way at sea. Figs. 3, 5 & 6 show these flaws. The introduction of the triple-expansive engine, with the three

cranks, gave better balance to the shaft, and the forces acting on the path of the crank-pin being better divided, cause more regular motion on the shaft and so to the propeller.

This is specially noticeable on screw steamers, and is already taken advantage of on passenger steamers by placing cabins further aft near the propeller; the stern having but little vibration, the dull and heavy surging sound due to unequal motion of the shaft in the two crank engines is exchanged for a more regular sound of less extent, and the power formerly wasted in vibrating the stern is utilized in propelling the vessel.

In spite of all those improvements I have mentioned, there remains the serious question of defects in the material due to variety of its quality, and the extreme individual care that has

side by side, resembling a bundle of faggots of about 18 or 20 inches square. The result was, that while the outside bars would be welded to one another, the inside would be improperly welded, or the hammer being weak the blow would be insufficient to secure the proper weld, and it was no uncommon thing for a shaft to break and expose the internal bars showing them to be quite separate or only partially united, as in Fig. 4.

This danger has been much lessened in late years by careful selection of the material, improved methods of cleaning the scrap, better furnaces, the use of the most suitable fuel, and more powerful steam hammers.

Still with all this care I think I may say there is not a shaft made of iron without flaws or defects more or less, and when these flaws are situated in line of the greatest strains, and

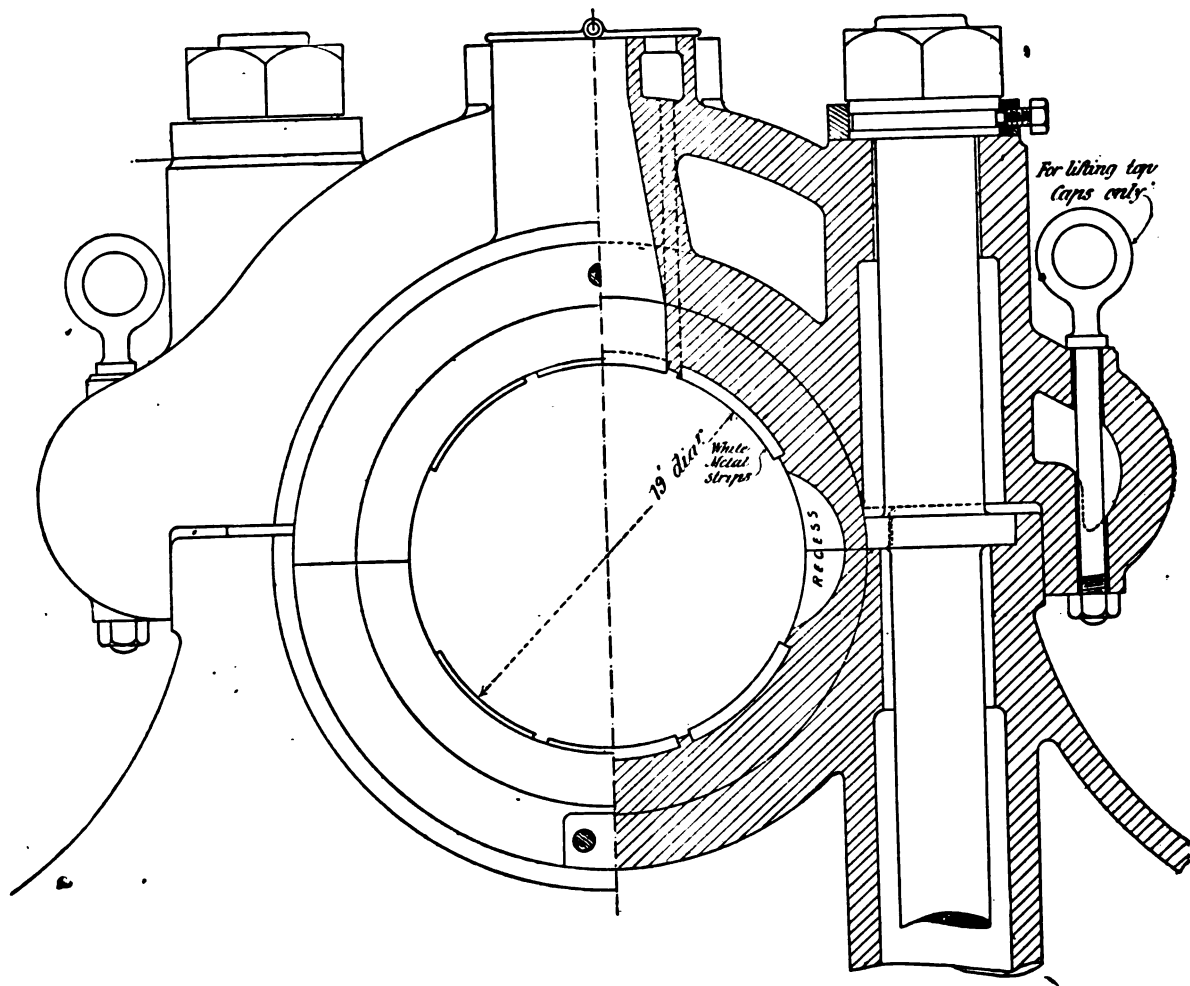


FIG. 2.

to be exercised in all the stages during construction of iron cranks or other shafts.

Many shafts have given out at sea and been condemned through no other cause than *original defects* in their construction and material.

The process of welding and forging a crank shaft of large diameter now is to make it up of so many small pieces, the best shafts being made of what is termed scrap, representing thousands of small pieces of selected iron, such as cuttings of old iron boiler plates, outtings of forgings, old bolts, horse shoes, angle iron, &c., all welded together, forged into billets, re-heated and rolled into bars; it is then cut into lengths, piled and formed into slabs of suitable size for welding up into the shaft.

No doubt this method is preferable to or stronger than the old method of "faggoting" so called, as the iron bars were placed

though you may not have a hot bearing, they often extend until the shaft becomes unseaworthy.

Fig. 4 illustrates the section of a shaft that gave way through not being welded about the centre; this shaft was made in 1869.

Fig. 5 illustrates the section of a shaft made in 1890. You will see this shaft gave way from original flaws situated near the outside of the section, the opposite of Fig. 4; these flaws were not observable when the shafts were new, although carefully inspected; they gradually increased under strain, came to the outside and were detected, having assumed the form as per Fig. 5. Considerable loss fell upon the owners of these vessels who were in no way to blame, nor could they recover any money from the makers of the shafts who were alone to blame.

I am pleased to state—and some of the members here present know—that considerable improvement has been effected in

the use of a better material than iron for crank shafts by the introduction of a special mild steel by Messrs. Vickers Son & Co., of Sheffield, and that instead of having to record the old familiar defects found in iron shafts, I can safely say no flaws have been observed when new, or during eight years' running, and there are now twenty-two shafts of this mild steel in the company's service.

I may here state that steel was used for crank shafts in this service in 1863, as then manufactured in Prussia by Messrs. Krupp—generally known as *Krupp's steel*—the tensile strength of which was about 40 tons per square inch, and though free from flaws were unable to stand the fatigue, and broke, giving little warning; it was of too brittle a nature, more resembling chisel steel, which you will see by the fracture as shown in Fig. 7; it was broken again under a falling weight of 10 cwt. with a 10 ft. drop, 12½ tons.

The mild steel now used was first tried in 1880; it possessed a tensile strength of 24 to 25 tons per square inch, it was then considered advisable not to exceed this, and err rather on the safe side; this shaft has been in use eight years, and no signs of any flaw has yet been observed; since then the tensile strength of mild steel has gradually been increased by Messrs. Vickers, the steel still retaining the necessary ductility and toughness to endure fatigue; this has been arrived at by improvements in the manufacture and more powerful and better adapted hammers to forge it down from the large ingots to the size required. The amount of work they are now able easily to subject the steel to, renders it more

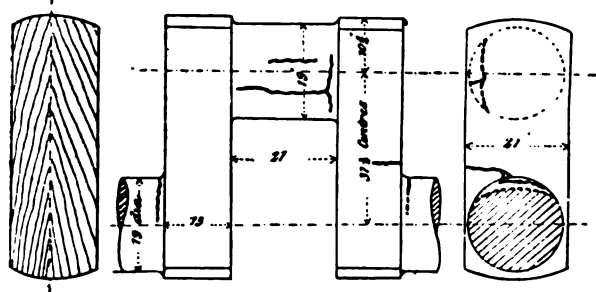


FIG. 6.

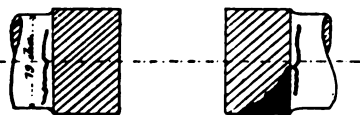


FIG. 3.

fit to sustain the fatigue, such as that to be endured by a crank-shaft. These ingots of steel can be cast up to 100 tons weight, and require powerful machines to deal with them; for shafts say of 20 in. diameter, the diameter of the ingot would be about 52 in., this allows sufficient work to be put in the couplings as well as the shaft. To make solid crank-shafts of this material, say of 19 in. diameter, the ingot would weigh 42 tons, the forging when completed 17 tons, and the finished shaft 11½ tons, so that you see there is 25 tons wasted before any machining is done, and 5½ tons between the forging and finished shaft; this makes it very expensive for solid shafts of large size, and it is found better to make what is termed a *built shaft*—the cranks are a little heavier, and engine framings necessarily a little wider, a matter comparatively of little moment.

I give you a rough drawing of the hydraulic hammer (Fig. 8), or strictly speaking, a *press*, used by Messrs. Vickers in forging down the ingots for shafts, guns, or other large works; this hammer can give a squeeze of 8,000 tons, the steel seems to yield under it like tough putty, and, unlike the steam hammer, there is no jarring on the material, and it is manipulated with the same ease as a small hammer by the use of hydraulic machinery.

The tensile strength of steel used for shafts having increased from 24 to 30 tons, and in some cases 31 tons, considering that this was two tons above that specified, and that we were approaching what may be termed *hard steel*, I proposed to the

makers to test this material beyond the usual tests, viz., tensile, extension, and cold bending test; the latter I considered was much too easy for this fine material, as a piece of fair iron will bend cold to a radius of 1½ times its diameter or thickness without fracture, and I proposed a test more resembling the fatigue that a crank-shaft has sometimes to stand, and more worthy of this material, and in the event of it standing this successfully, I would pass the material of 30 or 31 tons tensile strength. Messrs. Vickers readily agreed, and I give you a sketch of the apparatus used, viz., Fig. 9. Specimens of steel used in the shafts were cut off different parts, crank pins and main bearings (the shafts being built shafts), and roughly planed to 1½ inches square and about 12 in. long. They were laid on the block as shown, and a cast iron block fitted with a hammer head half-ton weight, let go suddenly, falling 12 inches; the block striking the bar with a blow of about 4 tons; the steel bar was then turned upside down, and the blow repeated, reversing the piece every time until fracture was obtained, and the bar ultimately broken.

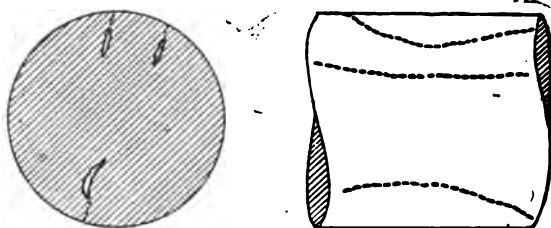


FIG. 5.

The results were that this steel stood 58 blows before showing signs of fracture, and was only broken after 77 blows; it is noticeable how many blows it stood after fracture; had this bar been hollow it would not have stood such treatment.

A bar of good wrought iron, undressed, of same dimensions, was tried and broke the first blow.

A bar cut from a piece of iron to form a large chain afterwards forged down, and only filed to same dimensions, broke at 25 blows.

I was well satisfied with the results, and considered this material, though possessing a high tensile strength, was in every way suitable for the construction and endurance required in crank shafts.

Sheet No. 1 shows you some particulars of these tests A.

	Tensile. tons.	Elong. 5	Bent. good	Blows to Fracture.	Broke blows.	Fall. 12 in.
A	30.5	28%	good	61	78	12 in.

In order to test the comparative value of steel of 24½ up to 35 tons tensile strength, I had several specimens taken from shafts tested in the manner described, which may be called a *fatigue test*. The results are shown on same sheet, B, C, D, E, F, G, H, I.

	Tensile. tons.	Elong. 5	Bent. good	Blows to Fracture.	Broke blows.	Fall. 7 in.
B	24½		good	64	72	7 in.
C	27	25.9%	good	48	54	12
D	29.6	28.4%	good	76	81	12
E	30.5	28.9%	good	71	78	12
F	30.5	28.9%	good	58	77	12
G	35.5	20%	good	80	91	12

The latter was very tough to break.

Specimens marked A shows you one of these pieces of steel.

I show you also fresh broken specimens G, H, I, which will give you a good idea of the beautiful quality of this material. These specimens were cut out of shafts made of Steel Company of Scotland's steel.

	Tensile. tons.	Elong. 5	Bent. good	Blows to Fracture.	Broke blows.	Fall. 12 in.
G	30.9	27½%	good	59	66	12 in.
H	29.3	30%	good	66	90	12
I	29.9	28.9%	good	53	68	12

I also show you three specimens of cold bending.

I think all of the above tests show that this material when carefully made and treated with sufficient mechanical work in

forging down from the ingot, is suitable up to 34 tons for crank shafts; how much higher it would be desirable to go is a question of superior excellence in material and manufacture, resting with the makers. I would however remark that no allowance has been made by the Board of Trade or Lloyd's for the excellence of this material above that of iron.

I was further interested to know how the material in the best iron shafts would stand this fatigue test compared with steel, and had some specimens of same dimensions cut out of iron shafts. The following are the results:—

	Tensile tons.	Elong.	Bent.	Blows to Fracture.	Broke blows.	Fall
J	186	243%	good	17	18	12 in.
		Made of best double rolled scrap $\frac{1}{2}$ cwt. Blooms.				
K	22	82½%	good	21	32	12

Best iron, three good qualities rolled into flat bars, cut and made into  $\frac{1}{2}$  cwt. Blooms.

coupling to one gauge, and made to fit each disc; duplicate discs are then fitted in each coupling, and the centreing is preserved, and should a spare piece be ever required, there is no trouble to couple correctly on board the steamer. Photograph shows a built shaft in the lathe. Fig. 10 shows the recesses and disc.

#### SCREW SHAFTS.

The propeller shaft is generally made of iron, as per Fig. 11, and if made *not less* than the Board of Trade rules as regards diameter, of the best iron, and the liners carefully fitted, they have given little trouble; the principal trouble has arisen from defective fitting of the propeller boss.

This shaft working in sea water, though running in *lignum vitae* bearings, has a considerable wear down at the outer bearings in four or five years, and the shaft gets out of line; this wear has been lessened considerably by fitting the wood so that the grain is end way to the shaft and with sufficient

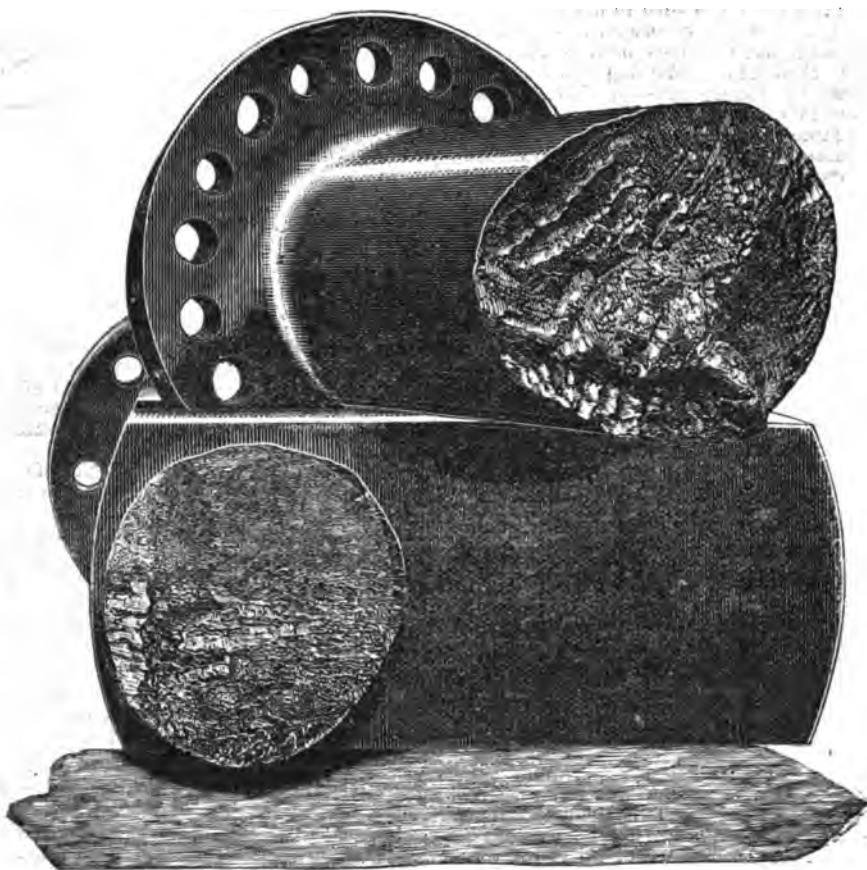


FIG. 4.

You will see from these results that steel stood this fatigue test 58 per cent. better than iron of the best quality for crank shafts, and I am of opinion that so long as we use such material as this for crank shafts along with the present rules, and give ample bearing surface, there will be few broken shafts to record.

I omitted to mention that built shafts both of steel and iron of large diameter are now in general use, and with the excellent machines, and under careful and special mechanics, are built up of five separate pieces in such a rigid manner that they possess all the solidity necessary for a crank shaft, the forgings of iron and steel being much smaller are capable of more careful treatment in the process of manufacture. These shafts when coupled up are 35 ft. long and weigh 45 tons; they require to be carefully coupled. Some makers finish the bearings in the lathe, after all are coupled, while others depend on the excellence of their work in each piece, and finish each separate.

To ensure the correct centreing of these large shafts, I have had a  $\frac{1}{2}$  in. diameter recess,  $\frac{1}{4}$  in. deep, turned out of each

bearing surface, these bearings have not required lining up for nine years; it is, however, a shaft that cannot be inspected except when in dry dock, and has to be disconnected from the propeller and drawn inside for examination at periods that experience suggests.

Serious accidents have occurred from want of attention to the examination of this shaft; the fact of its working in sea water and the liners forming the bearing part being made of gun metal, extensive corrosion takes place on the surface of the shaft close to the ends of the gunmetal liners, and more especially when the ends of the liners are faced up at right angles to the shaft, causing a hollow groove to be cut in the shaft by the action of the water force, and the corrosion caused by the presence of salt water, gunmetal, and iron, and it has gone on to such an extent that these shafts have given way inside the stern tube, breaking the latter and damaging the ship's hull to such an extent that it has caused the foundering of the steamer.

Steel has been used for screw shafts, but has not been found so suitable, as it corrodes more rapidly in the presence of salt water and gun-metal than iron, and unless protected by a solid liner for the most part of its length, a mechanical feat which has not yet been achieved in ordinary construction, as this liner would require to be 20 ft. long, for I find it exceedingly difficult to get a liner of only 7 ft. long in one piece, and the majority of 6 ft. liners are fitted in two pieces, the joint of the two liners is rarely water-tight, and many shafts have been destroyed by this method of fitting these liners. I trust that engine builders will make a step further in the fitting of the liners on these shafts, as it is against the interest of the ship owner to keep ships in dry dock from such causes as defective liners, and I think it will be only a matter of time when the screw shaft will be completely protected from sea water at least inside the stern tube; when this is done properly I would have no hesitation in using steel for screw shafts.

Sometimes only  $\frac{1}{2}$  in. is left; this is done by using round blocks and finishing under the hammer at a lower temperature than the rest of the forging was done, along with the use of a little water flung on from time to time, and it is remarkable when finished how near a forging is in truth when centred in the lathe, and how little there is to come off. The effect of this manipulation is to form a hard ring of close grain iron about  $1\frac{1}{2}$  in. thick from the circumference of the shaft inwards; the metal in this ring is much harder than that in the rest of the shaft and takes all the strain; the inner section yields consequently when strain is brought on in heavy weather, or should the propeller strike any object at sea or in the Suez Canal. A fracture is caused, and it has been my experience that a comparatively new shaft has been rendered unseaworthy from these flaws in no less than six months. Fig. 14 shows the section of a screw shaft that I had broken with one blow from the falling weight of a steam hammer.

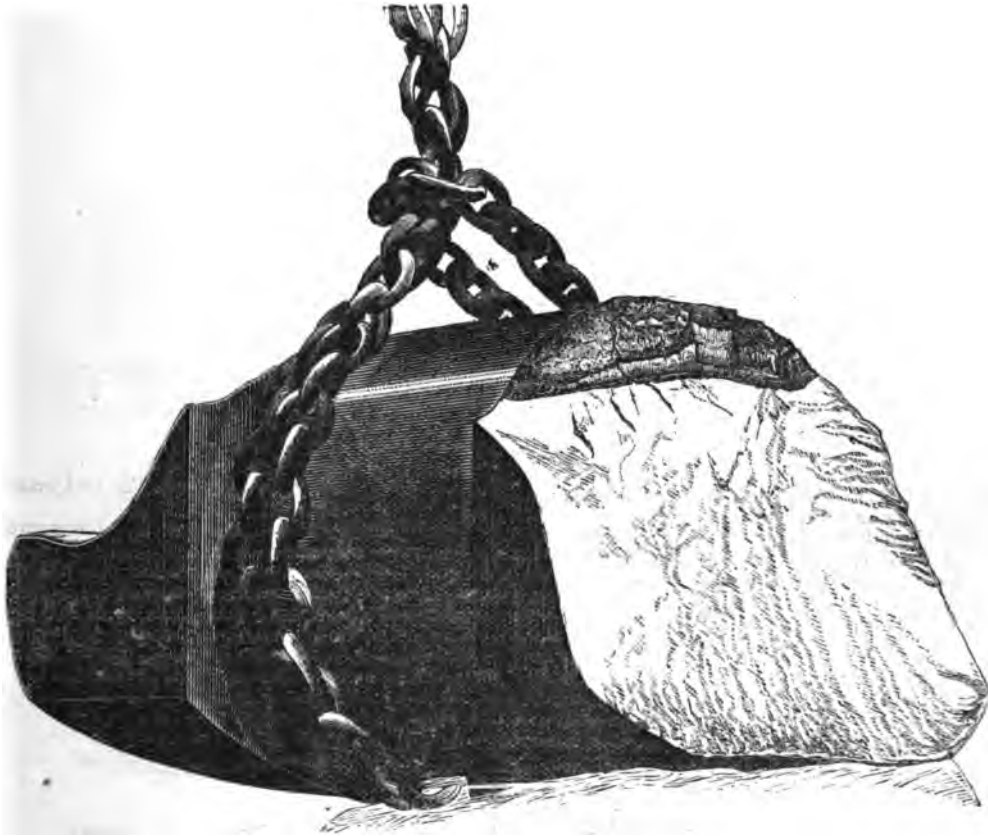


FIG. 7.

Though an easier forging than a crank shaft, these shafts are often liable to flaws of a very serious character, owing to the contraction of the mass of metal forming the coupling, the outside cooling first, tears the centre open, as per sketch Fig. 12, and when there is not much metal to turn off the face of the coupling, it is sometimes undiscovered, and having observed several of these cavities, some appearing only when the last cut was being taken off.

I have therefore considered it advisable to have holes bored in the end at the centre of the coupling as far through as the thickness of the flange where these shafts are of large size; this enables these flaws to be detected, and prevent serious accidents from this cause.

Another and somewhat different flaw is frequently found on the circumference of the shaft between the end of the gun-metal liner and the front of propeller boss, as in Fig. 13, caused by corrosion cutting the surface as already described, and the jarring strains on the shaft in a heavy sea. This serious flaw may be accelerated or caused also by the over finish put on the shaft (when the forgerman is not allowed ample material over the finished size) by the steam hammer, to save turning off.

You will see the hard ring I mention about 1 in. thick of close grained iron, while inside is the true grain of a size usual in these forgings. Once crack through this ring the shaft may break at any time. This shaft you will see was just taken out in time—the dark colour shows the extent of flaw.

I think more material should be allowed for the forging, so that the forgerman has not too much hammering to get a finish in order to save weight and reduce the cost of machining, and that this kind of treatment should be discontinued, so that the screw-shaft at this part takes the different strains on the greater part of its section; many screw shafts have broken there and led to serious loss, though their diameter was above what is considered necessary, and it is a point in construction that requires serious attention, and while we have got safe crank-shafts we require screw-shafts to be brought up to the same standard.

Some engineers have the uncovered part of this shaft between the gun metal liners inside the cast iron stern tube protected against the action of sea water by winding over it tarred line; as this may get loose on a long voyage and prevent the sea water getting to the *lignum vitæ* bearings by choking the water spaces,

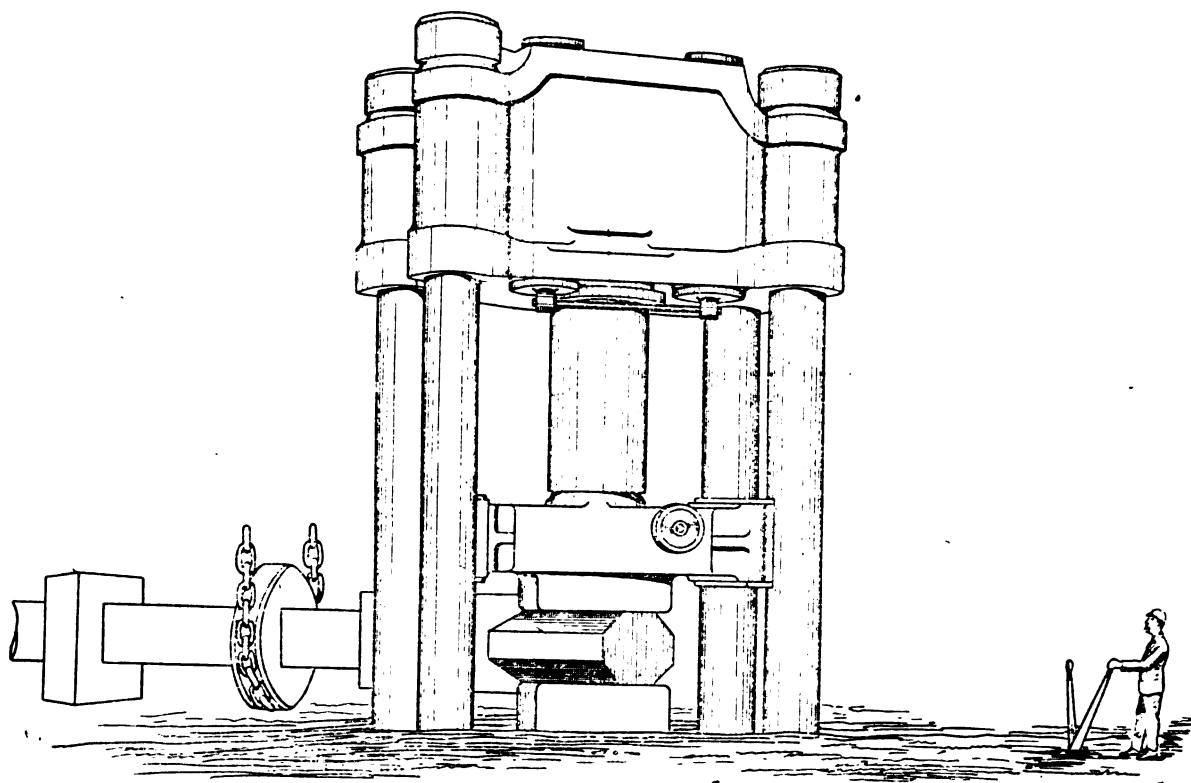


FIG. 8.

I have not adopted it, but shall be pleased to have the experience of any sea-going engineer on this important point.

Doing away with the outrigger post bearing is an improvement to the better working of this shaft, and convenience in shipping and unshipping the shaft, also when re-fitting the forward key, sufficiently long bearing must be given to compensate for the wear down of the lignum vitæ wood.

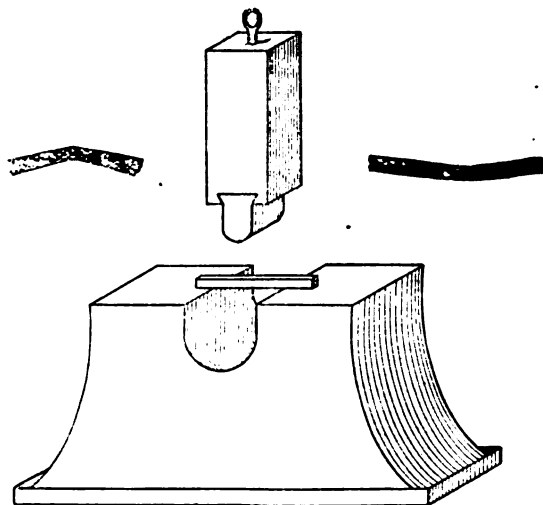
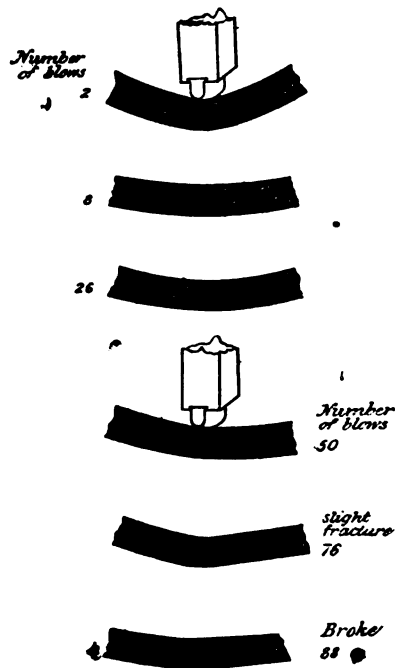


FIG. 9.

Freeing the shaft from the rudder-post allows the post and shaft to sustain their independent strains, and in the event of the vessels grounding or striking rocks, &c., under the rudder-post, it does not endanger the screw-shaft, it also reduces the weight of the rudder post, which is a matter of importance

when the post is overhung from the keel and the counter of the vessel.

Having placed these experiences and improvements in con-



nection with these important shafts before you, with a view to further improvement, I shall be pleased if some of the members will give the meeting some information on these important shafts, that will tend to their duration and efficiency.

The CHAIRMAN then invited discussion, saying they must all have felt, as he did, that they were listening to a Gamaliel amongst them, at whose feet they were sitting. He had never heard a more practical or useful paper than that which had just been read, and he thought the author had paid the Institute a very high compliment by putting such a paper before them, and that they ought to profit much by it.

Mr. A. BELDAM (President): I have been very pleased to hear Mr. Manuel's paper on the crank shaft and the propeller shaft. There is no doubt that rapid strides have been made since we first commenced heavy forgings of wrought iron shafts, and, as Mr. Manuel justly remarks, steel having come in, we do not get much credit from some of our neighbours for the use of this heavy and good material, of greater density and solidity. In my opinion, as a practical man, no solid crank shaft should be put in a ship, not even of 12 in. diameter. I think all crank shafts should be built shafts. I do not agree with casting the webs and the crank pin in one piece. I think all should be hammered. We depend, in the first place, on the soundness of that casting, though they pass plenty of them; but I think by first making the ingot we get a really good sound shaft, after the ingot has been carefully manipulated. But I believe, with such firms as Vickers, after the ingot is run, that ingot is watched night and day till it has cooled down, and if a click or noise is heard, it is condemned, for it shows there is something in it that cannot be annealed by hydraulic pressure or the hammer.

Mr. A. J. MAGINNIS said he could not add much to the value of the information which Mr. Manuel had brought forward, but it so happened that he had to do with perhaps the first important built steel shaft that was used in this country, and he thought no words could describe the deep consideration that was shown on every side by the superintendent engineer, by

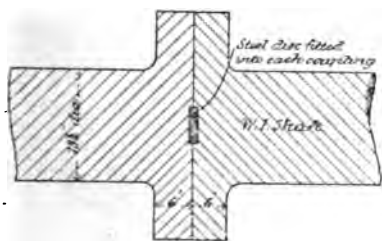


FIG. 10.

the firm who owned the ship, by the builders, by the owners of shafting all over the country, and such like, and he thought it was scarcely possible to describe what fearful thought and care had to be given to this subject. Mr. Beldam had just mentioned built shafts, and it dawned on him what a change had come about in a short time. He was speaking of about ten years ago, when he was set to work to endeavour to find out how many built shafts there were carried in steamers of any size in the three kingdoms. Perhaps the scope he had to look over was very limited, as he was tied to passenger ships, but there was not one single built shaft in existence of a size over 12 in., and the question was, Why should we go for built shafts at all? It was a case of being forced into built shafts, for there seemed to be no chance of getting a permanent life out of an ordinary forged shaft, and it seemed to be a case of renewing the shaft, in the heavy Atlantic trade, every 18 months or two years, and, consequently, they had to look round and see what could be done. He was not quite sure of the size of the shaft built, but he thought it was about 20 in., and it was decided it should be fitted to one of the mail steamers of the North Atlantic trade. After it was decided to have the shaft built, the question arose what to build it of, and how to build it, and what shape the webs were to be, and if it was to be fitted in the bed designed for the old shaft; and it seemed to be surrounded by difficulty. Ultimately Messrs. Vickers were consulted on it, and they said, "We will build you a shaft, and give you a guarantee with it;" and he thought he might say that that shaft was the father of all shafts that had gone since. It did its work admirably, and it was, for ought he knew, in perfect condition now, and the result was their common adoption. He thought he might safely say that the question of built shafts had done a way with the question of crank shaft flaws to a great extent.

Then as to the matter of propeller shafts, Mr. Manuel had tested them in the same way as he had done his crank shafts, and he thought he deserved a great deal of credit for the way in which he had brought forward this valuable information.

In regard to corrosion, which Mr. Manuel had referred to, he, the speaker, had successfully adopted the plan of abandoning brass and *lignum vite* in the boxes, and having the shaft put in plain, forged an inch larger in diameter, and filling the tube up with tallow, and he had found that water had never come inside the stern of the ship after running for three years. He was speaking of boats of about 2,000 tons. Whether the plan would answer so well for very large steamers he did not know.

Mr. Manuel spoke of the adoption of long liners. He (Mr. Maginnis) thought he was speaking to the fact, when he said that at the present time brass liners were being fitted on to shafts 18 and 20 ft. long and 18 or 20 in. in diameter. One of the defects of the system was that you could not get at the parts to examine them. He had a great deal to do at one time with the subject of corrosion, and he sketched out an arrangement by which, when the ship was light, you could uncover the openings of the stern tube, and clean round the shaft and examine it. He thought it was a good thing; but unfortunately he found himself in the position of a good many others, viz., that a gentleman was some years before him who made a very good and successful job of it indeed.

After some further discussion, in which Messrs. White, Barringer, and Gibb, took part,

Mr. JAMES ADAMSON (Hon. Secretary), said, in response to the Chairman, there were several members at the back who had been taking notes with the intention of speaking, and that was one reason why he wished not to rise, and he had just proposed to the Chairman that they should continue the discussion on a future night (cheers), so that they might be fully prepared to take up the subject where it had been left. No doubt a good many of them had had varied experience both in propeller and crank shafts, and perhaps a few intermediate shafts, and he thought if they brought their experience together on some future night they might reap considerable benefit—not only those members who were present, but those who were tossing on the mighty deep.

In regard to liners, there was a considerable difference of opinion as to whether they should be shrunk on or cast on. In

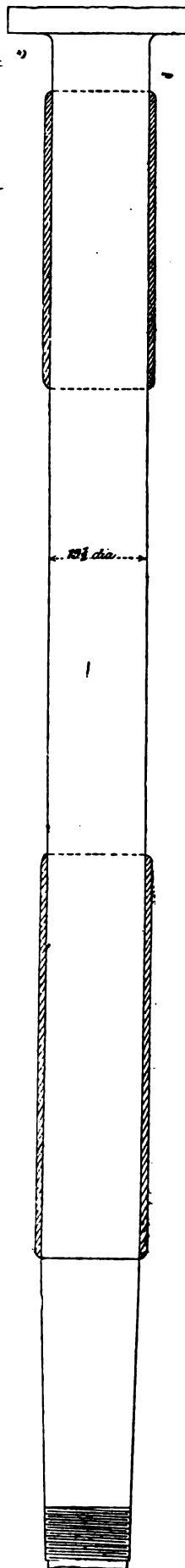


FIG. 11.

his experience he thought that liners that were carefully cast in stood the best.

The motion to continue the discussion at the next meeting was then agreed to, the Chairman intimating that it might be more convenient to Mr. Manuel to add any remarks he might have to make in reply on the present occasion.

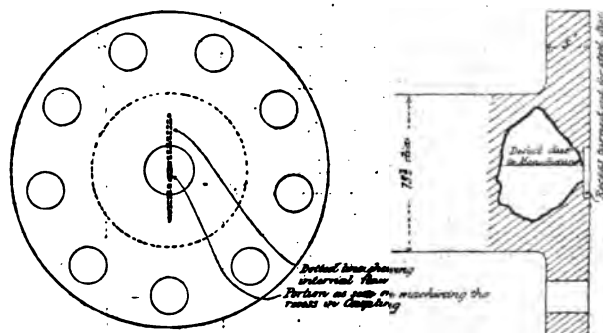


FIG. 12.

MR. MANUEL said the members who had spoken had left him very little to add. Mr. Beldam had referred to the great care required in the manipulation of steel, that it should be watched in the cooling, as it might give way in the centre with a crack that could be heard. He thought the same thing might apply to iron, and that the two were much alike. A mass of iron or steel, unless it were gradually and equally cooled down, was likely to do so, and he did not think that went against the use of steel in any way; but it showed that Mr. Beldam had watched the thing very carefully. They were much indebted to Mr. Maginnis for his interesting remarks, and also to the other speakers. In regard to water getting between the cast-iron and the iron shaft, it was necessary that the Inspecting

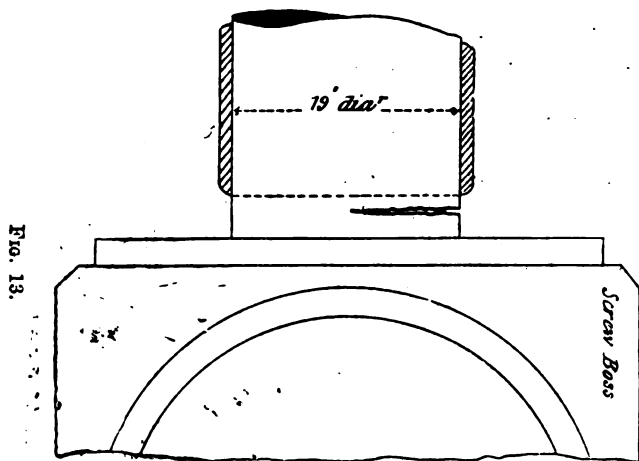


FIG. 13.

or Superintending Engineer, Surveyor or whoever had to inspect these shafts, should see that the screw-boss was fitted thoroughly water-tight to the shaft. If that were done there would be very little trouble found from water getting between the cast-iron and the iron shaft. Of course there was another plan of getting rid of that which was very successfully done, and he had done it himself in one instance, and he thought he should be inclined to repeat it, and that was, after you had fitted the boss on to the shaft, to bore two holes in the boss to the space round the shafts, and filling the space up with tallow. By doing so in a proper manner you were enabled to prevent the water, even if the shaft were not a very good fit, from getting to the shaft to corrode it. He thought that was a very good plan. He thought Mr. Adamson's proposal that they should

continue this discussion at the next meeting a very good one. It was a most important question, and he thought that as many as possible should give their experience on the matter and any suggestion which they might think would tend to the endurance of these shafts, they must bear in mind also, that while they are having their minds exercised in this direction it was labour that would not be lost. It might be the means of saving life and property. They did not think sometimes so much as they ought to do, and if they were to go about their work with these views before them he thought the skill of the engineers of this and other countries would be the means of saving life and property, and what could they do better? (Cheers.) He should endeavour to attend the next meeting. (Hear, hear.) He thanked them for the way in which they had received his paper and for the honour they had conferred on him in electing him a Vice-President of the Institute. It would be his endeavour to do all in his power to forward its interests, and he thanked those gentlemen who had brought them together and formed them into a Society of Marine Engineers, following after the style of the Institute of Naval Architects. They could come there and discuss many important subjects which would have the effect of elevating their minds and fitting them the better for the duties which they had to perform.

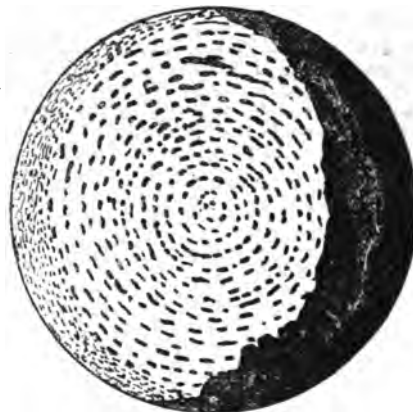


FIG. 14.

THE CHAIRMAN, in proposing a vote of thanks to Mr. Manuel for his very interesting paper, pointed out how important it was that they should pay attention to the details of every accident that occurred on board a steamer. The breaking of a shaft was providential in the way of their education. (Laughter.) Great improvements had been made in shafts, and much assiduity had been bestowed upon their improvement. By whom? Not by them, not by sea-going engineers, so they must not be too proud; but marine engineers had to do with such complication of machinery on board that it was surprising to him that more of them did not get to the mad-house or jump overboard! (Laughter.) They were, he thought, within measurable distance of getting a steel twice as strong as that now used, and of great utility and cheapness if there were only the demand for it. He had not been so much amongst the practical part of the work of late years as he used to be; therefore his information was somewhat second-hand as compared with Mr. Manuel's, but when he got through the work that he now had on hand he hoped to visit steamers more than he had, and to get out of engineers all they would give him and more than they thought they knew themselves, perhaps. (Laughter and cheers.) The vote of thanks having been duly seconded and carried.

MR. MANUEL briefly acknowledged the same.

MR. BELDAM then proposed a vote of thanks to the chairman, which was duly carried and responded to.

For want of space we are obliged to hold over until next No. the article on "The Corrosion and Fouling of Steel and Iron Ships."

## THE PARIS EXHIBITION, 1889.

## NAVAL ARCHITECTURE AND MARINE ENGINEERING.—II.

A RIVER Ganges native boat is also noteworthy on account of the relative perfection with which the skin of the vessel is constructed. It is carvel planked, the planks being united at their longitudinal edges by iron cramps. Above what would be the main deck if it were completely laid, is an awning deck-like erection, having bamboo beams and framing, and thatched over for a portion of its length. These vessels vary in the extent and height of their deck erections, but the model is a fairly typical one, and shows great sheer aft. One square sail, secured to a gaff-like spar, is the sole means of sailing the craft.

There is a strange similarity between the representation of an Italian barge, or coasting vessel, as now existing, and a Malayan craft. Both have two masts with sails and two rudders, one on each quarter. The latter is also provided with eight oars, and is not unskillfully modelled below water, but its great depth in relation to its length, which is 64 ft., and the fulness of the above water form, forcibly reminds one of the British old collier ships of box-like form, which, prior to the abolition of the old measurement tonnage, carried coals to the metropolis.

Another striking similarity is seen between the native boats of the River Nile and the Patamaz, of the coast of Malabar, both of which are represented by models, as are also Chinese ordinary and pleasure junks, the latter resplendent with magnificent carving.

The native craft of that most Western-notioned Eastern country, Japan, is represented by a model made from particulars obtained in 1888 from a vessel still existing, but not in good repair, in which, prior to the adoption of steam propelled vessels, the magnates of Japan were accustomed to make their sea voyages. Although the craft has fairly fine ends, it is also an example of primitive naval architecture, and would barely be recognised by the many pushing Japanese who have found their way into our engine-shops and shipbuilding yards, at the expense of their Government and friends, to make themselves *au fait* in modern ship and engine designing and construction.

Leaving exhibits of Eastern and remote countries, we find a number illustrative of vessels existing recently, and some no longer to be seen, belonging to Holland, France, Spain, Italy, &c.

Most remote in time is a full-rigged Dutch ship, with 56 guns of the seventeenth century, which has some peculiarities in its rig, the bowsprit and jibboom having abnormal steer, and in place of a driver and a mizen square sail, a triangular or jib-shaped sail being substituted. There is also what is styled a Dutch yacht, or boat of pleasure, dated 1810, having a half-deck; but Dutch pleasure must be very slow if this is anything like a typical craft, as it could barely have sailed more than two or three knots an hour.

French vessels of special types are represented by models as follows:—

There is one of the craft known as *chebecs*, which, during the period of 1750—1786, were noted for the fast sailing and manoeuvring powers.

They may be described as a reduced galley and had a very large spread of canvas. The coasting and fishing vessels known as Tartans which in the last century plied in the Mediterranean, and frequented especially the port of Marseilles, are also represented by a model made from the particulars of a vessel existing in 1789. On the card attached the principal scantlings of this vessel are given, and visitors are informed that subsequently to the date already mentioned the Tartans of Marseilles have all but disappeared before the incessant activity of steam vessels.

Another species of French sailing coaster is the bomb ketch, and a model of one of this class, that of *La Volonte de Dieu*, a vessel of 144 tons, existing or built in 1816, is on view. As the name of this type of vessel implies, they were analogous to the war ships known as galliot bomb-vessels, but they too are said to have disappeared more and more from the coast of Provence, where formerly they were numerous.

Turning to other countries, we find Greek coasting vessels of peculiar rig, slight depth, and fine lines, the model being dated 1835; a Spanish Mediterranean coasting vessel, with main and jigger masts, having three triangular sails, and enormously large sail area for the immersed area of hull, dated 1880; an

Italian merchant vessel, known as *trobocolos*, to be met with in the Adriatic Sea. These vessels have great beam, fairly good lines below water, but with the weather deck kept wide both forward and aft. The model shows the sails all of different colours, a somewhat barbaric arrangement. The model is dated 1882, and the onlooker is informed these vessels are sometimes to be seen in Marseilles, but steam navigation will probably cause these vessels all to disappear at an early date. Certainly when all sailing vessels disappear we shall be poorer in the picturesque, but there will be some compensation, as a larger number of sea-going engineers will be required. In this Retrospective Exhibition there are other models to be seen, including Maltese rowing boats, Turkish and Norwegian fishing boats. There are also a number of elaborately constructed models of French harbours, dry docks, and other accessories. Some attempt has also been made to show the advance in the actual working operations, hand and machine labour being contrasted by means of wood-working tools, ordinary smiths' hearths, models of blast furnaces, iron works with rolling mills, steam hammers, etc. Many of the exhibits relating to harbours, which include the model of a primitive dredger constructed in 1824, have been contributed by the French Minister of Public Works. The harbour of Marseilles, with its 11 dry docks, is perhaps the most important; but, besides the detailed sections showing the construction of quays at Rouen, and piers at several ports, there is a splendid show of miniature representations of bridges.

To those interested in lighthouses, and all the appliances connected with them, as well as the construction of buoys, there are a large number of historic exhibits, including some splendid examples of models of lighthouses constructed of the materials used in the actual construction—viz., stone or iron. We especially noted a lighthouse, erected in New Caledonia in 1866, of the latter material; also the first electrical machine of La Compagnie Alliance, constructed by M. J. Van Malderen, in 1859.

A chart, dated 1613, representing the Mediterranean, West Coast of Africa, North America (as far north as Labrador), and a large portion of South America, is of some interest—and besides other objects in this Retrospective Exhibition of Work appertaining to navigation, shipbuilding and engineering, which are scarcely of sufficient interest to be noticed—we saw parts of an actual steam-engine manufactured by La Compagnie d'Anzin in 1730, including the piston, about 4 ft. diameter, and the pump chamber. Engineering is not, however, as will be gathered from our account of our visit to this department, at all well represented.

For some unexplained reason, a number of exhibits relating to marine and land steam engines, of historic interest, have been placed in two large cases, situated amongst the French exhibits in the Palais des Machines, although they would have been more appropriately in the "Retrospective" Exhibition. Some of these we will briefly refer to, in closing the present article.

In the cases alluded to, a number of models of parts of engines are shown, and on a card the name of the French inventor, or on some case more appropriately the name of the French adopter and the date of the adoption, are given. Those we singled out for mention are relating more especially to marine engineering, but many of our readers who visit the Exhibition, may find it of interest to glance at each of these memorizers.

Papin, as might be expected, chronologically heads the list. He is credited with inventing the safety valve in 1681, and the piston in 1690. Steam navigation is also coupled with his name and the year 1698. We have no desire to minimise the credit due to this celebrated Frenchman, but it is scarcely necessary to remind our readers that no practical result came from Papin's experiments in steamship propulsion. The screw propeller was apparently invented by Charles Dallery in 1603, at all events his name is coupled with it, as also are De Lisle's in 1823 and Frederic Sauvage in 1832. Coming down to later years we find Benjamin Normand's name associated with the compound engine as early as 1856 and with the triple-expansion engine in 1872.

No doubt it is very proper in a French Exhibition to give due honour to French engineers. The Paris Exhibition is, however, more or less international in its character, and it forcibly strikes one, that in any case, if the British Committee of the Retrospective Exhibition were aware of the character of these last exhibits we have referred to, they might at least have similarly honourably remembered the many British pioneers in engineering. It would have been pleasing, we believe, alike to our neighbours on the Continent as to ourselves, to have had within

a limited space, mention of Watt, Miller, Taylor, and Symington, who were all more or less associated with the practical inception of steamship propulsion, besides other celebrated engineers. Certainly, in the *Charlotte Dundas* model we have a memorial of the last-mentioned, but he is only one of a large number who have since been associated with the development of steam navigation. If our space permitted we would recall the names of our countrymen who experimented with the screw-propeller, and finally made it a success. Similarly with the construction of engines of a more economical type, John Elder, Charles Randolph, John M. Rowan, and a host of others might have been mentioned; and in connection with the triple and quadruple-expansion engine, Dr. A. C. Kirk and Mr. Walter Brook, of Messrs. Denny Bros., of Dumbarton. But it would be easy to indicate many things which might have been done in the British section, for on the whole, as those of our readers who visit the Exhibition will find, we do not shine nationally.

### THE LATE ROBERT DUNCAN, SHIP-BUILDER, PORT-GLASGOW.

#### INTERESTING REMINISCENCES OF EARLY STEAMSHIP BUILDING.

DEATH has been lamentably active of late in thinning the ranks of those who have materially helped to maintain the Clyde in that position of proud eminence as a shipbuilding centre which it has for so long occupied. Mr. William Denny, of Dumbarton, Sir William Pearce, of Fairfield, Mr. John Macmillan, of Dumbarton, and Mr. James T. Caird, of Greenock, are amongst those who have had to yield to the summons of the Grim King within a remarkably short period, and to this melancholy list must now be added the name of Mr. Robert Duncan, of Port-Glasgow. This eminent shipbuilder and estimable gentleman died on Wednesday, the 3rd ult., at his residence of Ardenolutha, Port-Glasgow, after a few weeks' illness, and was interred in the local cemetery on the 6th ult., amidst every token of public sympathy. Mr. Duncan was born in Greenock in 1827 and was the first of a family of six. His father (Robert Duncan also) was the builder of the steamer *Britannia*, the well known pioneer of the Cunard fleet, and of the *Clyde* and *Teriot*, the first of the West India Royal Mail Line. From an early age young Duncan was deeply interested in the science and art of shipbuilding. At the time of his birth his father was partner in the shipbuilding firm of James Macmillan & Co., but in 1830 the partnership was dissolved, and Mr. Duncan senior began business on his own account under the title of Robert Duncan & Co., his shipyard being part of the site now occupied by the Victoria Harbour. The first vessel built here by Mr. Duncan was a river steamer, contracted for by Mr. David Napier, the eminent engineer, and named the *Earl Grey* (after the then popular Reform Minister). Very successful as regards speed, this early Clyde river boat was most unfortunate in other respects, having been burned and sunk in Rothesay Bay and, some years afterwards, blown up at Greenock Quay, killing and injuring a large number of people. In 1836 Mr. Duncan started a second shipbuilding yard in the Cartsdyke district of Greenock (now part of the yard occupied by Messrs. Scott & Co.), and here in 1839 the *Britannia* was built (under contract with the celebrated Robert Napier) for the Cunard Co. The contract for the *Clyde* and *Teriot*, the first of the West India Royal Mail Line, followed, but fate stepped in to prevent the elder Duncan from thoroughly completing the undertaking. He launched the *Clyde* in the end of February, 1841, and immediately after was seized with an attack of typhus fever, to which he succumbed on the 17th March following, at the early age of 38. Some years before this event, the celebrated Mr. Scott Russell came to Greenock, under engagement with the old engineering firm of Caird & Co. (not the present firm of that name) the senior partner of which was the father of Principal Caird and of his brother Prof. Edward Caird, of the Glasgow University. Mr. Scott Russell's scientific reputation had secured him the appointment of superintendent of construction of the steamers of the West India Royal Mail for four of which Messrs. Caird & Co. made theinery. Being somewhat congenial spirits, Scott Russell the elder Duncan were fast friends, and in 1840 the latter for Scott Russell the river steamer *Flambeau*, which was first practical illustration of the celebrated "Wave-Line"

principle of ship-design, with which the name of Scott Russell was subsequently so closely associated. In addition to his other work Scott Russell was engaged on behalf of the British Association (of which he was at that time one of the most distinguished members) on an elaborate investigation into the forms of "least resistance" in ship-shape bodies. For this purpose he leased "Virginia House," a former residence of Roger Stewart, a famous Greenock shipowner of the early part of the present century; and in the grounds of this old mansion house, an "Experimental Tank" was erected (probably the first establishment of the kind in Great Britain) in which systematic tests were made—though perhaps on a less perfect system than is now in vogue—of the speed and resistance of the various forms which Mr. Russell's ingenuity evolved as the possible types of the steam fleets of the future. Scott Russell's office and the adjacent experimental tank were the famed resort of scientific men from all countries, and especially for those of our own country whose talents and interests were bound up in furthering the development of steam navigation. Here John Wood, the builder of the famous *Comet*, also his brother Charles, were frequent visitors, and it was here that young Duncan in 1842, then a lad of sixteen, was launched into the mysteries of the science of naval architecture as then understood, and of tank experiments of ships and waves. In the early part of 1844 Scott Russell removed to London, the Virginia House experiments came to an end, and young Duncan was forced to seriously consider the position. His father's business since his decease in March, 1841, had suffered from mismanagement, and owing to this fact and the commercial disasters of that time it had meantime succumbed. After Scott Russell's departure in 1844, therefore, the subject of our sketch entered upon a term of practical apprenticeship with the firm of Robert Steele & Co., Greenock (now unhappily also wound up). On the completion of his apprenticeship term with Messrs. Steele in 1850, and with a view to complete his technical education, he went to sea for a short time, and on his return, about the end of 1851, became manager to Mr. James Macmillan, his father's former partner. In the spring of 1853 he went to Glasgow to manage the shipbuilding department of Mr. J. G. Laurie's business, but in 1855 a better appointment offering itself he became manager to Messrs. Smith & Rodger (now the "London & Glasgow Shipbuilding and Engineering Co., Limited," a position he held till 1862, in which year he left to begin business on his own account in Port-Glasgow. John Wood, the builder of Henry Bell's *Comet*, having died in 1861, "the historic birth-place of the steamship" as his little shipyard has been called, was then in the market for sale. Mr. Duncan with other two partners (Mr. John McGregor, son of a partner of the firm of Tod & McGregor, carrying on business at Partick, and Mr. John Hamilton, now partner in Messrs. Robert Napier & Sons) bought the site, to take share in the building of iron ships just then making rapid progress. The area of the original building-yard was about six acres, and it has since been added to, in various ways, until at present it exceeds eleven acres. The spot—for it could scarcely be called more than a "spot"—on which the *Comet* was built is now covered by some of the furnaces of the enlarged shipyard.

In 1870 Mr. Duncan's two partners retired, and he was left sole partner. A most promising prospect opening up at this time in connection with the great shipbuilding works about to be established at Barrow-in-Furness, he became managing director of the Barrow Shipbuilding Co., with the Duke of Devonshire as Chairman, Lord Frederick Cavendish, and Admiral Egerton—son-in-law of the duke—as co-directors. His knowledge and skill were employed in the designing and laying out of the works which have since assumed such gigantic proportions, but (as Mr. Duncan has himself been known to remark in this connection), "All is not gold that glitters," and in 1875 he resigned his directorship, and thereafter confined himself to carrying on and developing his own establishment at Port-Glasgow. In 1883 he assumed, as partners, his three eldest sons, and father and sons together, since that date, have conducted the business with intrepidity, skill, and success. The firm during the course of 27 years has turned out over 210,000 tons of shipping, comprising 244 vessels of all kinds and sizes, up to 4,000 tons gross register. The firm's largest annual output was that for the year 1883, when the figures reached 16,584 tons. Of the largest tonnage the firm have produced for individual companies, Messrs. P. Henderson & Co., Glasgow, come first, with 31,260 tons. Altogether the firm have had transactions with approaching 60 separate shipowners or shipowning companies, and with most of them more than once.

While resident in Glasgow as manager to Mr. J. G. Laurie and to Messrs. Smith & Rodger, Mr. Duncan was one of the founders and the first secretary of the "Scottish Shipbuilders' Association," and at the incorporation of this body with that of the "Institution of Engineers" in 1865, Mr. Duncan was Vice-President. In 1872 and '73 he was President of the united bodies, known then and since as the "Institution of Engineers and Shipbuilders in Scotland," and in 1877 he was elected a member of council of the better known "Institution of Naval Architects." On the appointment of the Load-line Committee, by the Board of Trade in 1883, to investigate and, if possible, render a solution of the much-vexed problem of a safe and equitable load-line for British shipping, Mr. Duncan was elected by the Clyde shipowners to represent them on that committee. As a prominent member and office bearer in the two societies named, as concerned with his profession, Mr. Duncan contributed several important addresses and papers, and took frequent part in the discussions upon others. In January, 1887, he delivered before the Philosophical Society of Greenock, in commemoration of the birth of James Watt, an address on the progress of shipbuilding during Her Majesty's reign of fifty years. While enlarging and speaking exultingly of the marvellous development that had taken place in the period named, Mr. Duncan looked upon it very much as a prelude to something very much more marvellous still in the history of shipbuilding and engineering.

Notwithstanding Mr. Duncan's active professional engagements, he devoted much time and untiring attention to the welfare of his employees and the inhabitants of Port-Glasgow generally. He served as first Chairman of the School Board, and for a long number of years in the capacity of Councillor and Bailie in the Town Council. He was for many years, and up till his death, Honorary President of the Abstainers' Union in Port-Glasgow, and he was approached a few years ago with a view to his becoming a candidate in the Liberal Unionist interest for the Kilmarnock burghs. Although well qualified for such a position, Parliamentary honours seemed to have no charm for him, and he declined the intended honour. His death is deeply lamented by all classes in the community, and is mourned by a widow and grown-up family, three of whom are sons engaged in the conduct of the shipbuilding works.

## NEW SERVICE FROM WEYMOUTH TO THE CHANNEL ISLANDS.

THE Great Western Railway Co. have organised a new Service to the Channel Islands and for the passage from Weymouth entrusted the construction of three vessels to Messrs. Laird Bros., Birkenhead.

They are named respectively the *Lynx*, *Antelope*, and *Gazelle*, and are all launched and nearly complete.

The first of the three, the *Lynx*, made her official trial trip in Liverpool Bay on Thursday, July 4th, with highly satisfactory results, attaining a speed of 16½ knots, with 1,700 I.H.P., and 120 revolutions, considerably in excess of the contract.

Her dimensions are:—Length, 235 ft.; beam, 27 ft. 6 in.; and depth of hold, 14 ft., with a tonnage of about 880 tons O.M., and the load draught of water is about 11 ft.

This will ensure better sea-going qualities than in many of the steamers crossing the English Channel, which, owing to the exigencies of the harbours, have to be of lighter draught.

She is schooner-rigged, with two pole masts and two funnels, and is a smart, handsome vessel, having a turtle-back forward covering in the crew's quarters, and affording shelter from the weather; a spacious bridge deck amidships, nearly 100 ft. long, and a half-poop over 50 ft. long.

She is fitted with two distinct sets of direct-acting inverted triple-compound engines.

The crank-shafts, piston rods, pistons, and some other parts of the machinery are of steel, by which additional strength is gained without increase in weight.

Steam is supplied by two cylindrical steam boilers, worked under forced draught on the closed stokehold system.

The adoption of twin screws is a great factor of safety, and will add greatly to the security and comfort of passengers in case of accident to the machinery, as should one set of engines or the rudder become disabled, the vessel can be propelled in perfect safety and at more than her normal speed, a fact to

which the travelling public are now learning to attach due importance.

The passenger accommodation is of a very superior order, and the first-class saloon, ladies' cabin, and sleeping cabins are all in the centre of the vessel, forward of the machinery. This being the position least affected by the motion of the ship in rough weather, travellers will find it a vast improvement on the common practice of placing the first-class accommodation in the after part of the vessel, where the pitching motion and the vibration of the machinery are most felt. The first-class saloon, which is on the main deck, extends the full width of the vessel, and is handsomely fitted in varied hard woods, tastefully decorated and upholstered, and arranged with sofas round the sides, with tables and revolving chairs for dining. There are on the same deck a very prettily-arranged ladies' cabin, and, entering off the saloon, three well-arranged private cabins; also a pantry and bar, lavatories, and a smoking room. On the lower deck under the saloon, and receiving light and ventilation through a central opening from it, is a large sleeping cabin, with several private staterooms opening off it. The bridge deck is approached by a convenient stairway, and on it are provided sheltered seats, and it affords ample promenade for the passengers. The second-class accommodation is under the half-poop, and consists of a comfortably-furnished saloon with sofa berths round for 26 passengers, together with ladies' cabin, lavatories, etc. The captain's cabin is in a house on the bridge deck, the officers' rooms under the turtle-back forward, and the crew and firemen are berthed in the lower forecabin. The vessels will be lighted throughout by electricity, and generally the comfort and safety of the passengers will be found to have been studied with the greatest care and provided for by the introduction of the most modern and improved appliances that mark the first-class passenger steamer of the present day. The holds are specially arranged and fitted for carrying fruit and vegetables, and every precaution has been taken to prevent damage by reason of too close stowage, etc. The vessels are fitted with steam windlass and steam steering gear, and are provided with two steam winches, with auxiliary boiler in working hatches. The outfit of boats, ground tackle, etc., is in accordance with the Board of Trade requirements for passenger steamers, and the vessels have a Board of Trade certificate for hull and machinery.

Mr. David MacIver, one of the Directors of the G.W.R. Co., Captain Squire, T. S. Lecky—their marine superintendent—and Mr. Harris, engineer, were on board during the trial, together with Mr. Laird, Mr. Bevis, Mr. Owen Wynne, and a small party of local gentlemen.

## STEAM TRIALS OF HER MAJESTY'S SHIPS "TRAFALGAR" AND "MELPOMENE."

HER Majesty's ship *Trafalgar*, designed in 1865, and launched at Portsmouth as far back as September, 1867, concluded her engine trials last month. Though the machinery has been completed on board for more than a year, and might have been tried under way at any time during the interval, it was not deemed expedient to arrest the work going on and to steam the ship until she had approximated to her sea-going trim. The *Trafalgar* measures 345 ft. in length, and 73 ft. in beam, and the propelling engines, by Messrs. Humphrys, Tennant & Co., are designed on their well-known principle, from which they have never seen reason to depart since three-cylinder vertical engines were first introduced into the service, and the soundness of which was demonstrated by the series of commissions served by the *Alexandra* and *Téméraire* in the Mediterranean. The engines of the *Trafalgar* are identical in all respects with those supplied by the same contractors to the *Victoria* and the *Sans Pareil*, the only difference being in the boiler arrangements. Steam is supplied at a pressure of 185 lbs. by six very large boilers of the usual Admiralty cylindrical pattern, formed entirely of steel, and disposed into two separate stokeholds, divided by longitudinal and athwartship bulkheads.

The natural draught trial for six hours was made in the Solent, on June 26th. As the engines had been lying idle since May, last year, awaiting the convenience of the Dockyard authorities, nothing further in the first instance was contemplated than a preliminary spin; but, as the machinery worked

to perfection, it was determined, after a short gallop up and down the course, to proceed with and finish the trial. This was accomplished with the following gratifying results:—Pressure of steam, 132½ lbs.; vacuum, 27½ in. and 27 in.; revolutions, 85½ and 86; and collective horse-power, 8,481. This was nearly 1,000 in excess of the contract, with proportionate acceleration of speed, which was 16·219, or only a little below what the ship was expected to realize with closed stokeholds.

The crowning trial for four hours under forced draught—an ordeal which is not more calculated to test the endurance of the engines under exceedingly trying conditions than to test the physical endurance of those in charge of them—was successfully carried out last week. The importance of the trial, combined with the fact that the ship was the first of her class to steam, attracted a large staff of officials on board, Captain Dale, of the Portsmouth Steam Reserve, took command, and amongst those present were Mr. W. H. White, Director of Naval Construction; Mr. Durston, Engineer-in-Chief of the Navy; Mr. Butler, from the Admiralty; Mr. Heffernan, Chief Inspector of Machinery; and Messrs. Corner and Mayson, belonging to the Steam Department of the Dockyard. The contractors' firm were represented by Mr. Robert H. Humphrys and Mr. T. Soper, formerly of the Admiralty. At 11 o'clock the monster vessel drew away from the jetty. Her trim was 27 ft. forward and 28 ft. aft, which gave her her designed mean load draft of 27 ft. 6 in. The propellers consisted of two four-bladed screws, having a diameter of 16 ft. 6 in., and a pitch of 21 ft. 3 in., while the coal used was of Harris's Deep Navigation quality. After making four runs upon the measured mile, the *Trafalgar* was started for a long run out to sea beyond the Warner and Nab lightships, and as far as the Owers off Selsey Bill. During her progress, even with a light breeze from the north-east and a perfectly smooth sea, it was impossible not to be struck by the remarkably high wave which she threw up under great speed. At the stem it broke in a continuous stream over the guard-rail, while on each bow there rose a green, unbroken mass of water, forming a trough in which the ship moved. Steam was steadily maintained at an average pressure of about 134 lbs., the vacuum in the starboard and port condensers also showing a high mean of 27 in. As the result of the half-hourly observations, the following averages of performances were worked out at the end of the trial:—Revolutions, 95; mean pressure—high, 52·2 and 53·5; intermediate, 28·3 and 27·3; low, 13·8 and 14·1. The total H.P. developed was 6,409 by each set of engines, a coincidence so extraordinary that it was at first supposed an error in calculation had been committed. Subsequent examination, however, verified the results, so that the collective indicated H.P. amounted to 12,818 or 818 horses more than were guaranteed. The maximum power observed at any time was just over 13,100. The mean speed of the ship was 17·282 knots, which is also considerably in excess of what was estimated. The *Trafalgar* lay at Spithead for the night and returned into harbour the next morning.

The *Melpomene*, which was built at Portsmouth, and engined by Messrs. Palmer & Co., of Jarrow-on-Tyne, has also completed her steam trial in the Solent, and, as the *data* show, with highly successful results. The engines are of the same horizontal type as those supplied to the *Marathon* and *Magicienne*, having been manufactured from the same specifications. The cylinders are of the respective diameters of 34½, 51, and 76½ inches, and have a stroke of 3 ft. Steam is generated in four double-ended boilers, having a length of 18 ft. 4 in., and a diameter of 12 ft. 3 in. There are 24 furnaces, the outside diameter of which is 3 ft. 2 in. The total grate surface is 450 square feet, the total heating surface 13,970 square feet, and the safety valves are weighted to blow off at 155 lbs. pressure. The contract power to be realized under forced draught is 9,000 horses, the air pressure not to exceed 2 in. of water. As a matter of fact the average pressure on the trial was 1·7 in. The ship was in command of Commander Dickson, and the trial was watched by Mr. W. Dunn and Messrs. Butler and Goodwin, from the Admiralty; Mr. Mayson, from the Dockyard; and the Chief Inspector of Machinery belonging to the Steam Reserve; while the contractors were represented by their manager, Mr. Percy Hall. The mean draught of the ship was 17 ft. 6 in. As a series of experiments are being made at the present time with different patterns of propellers, with a view of determining those most suitable for the "M" class of cruisers, it may be mentioned that on the trial the *Melpomene* was driven by three-bladed screws, having diameter of 12 ft. 3 in., a pitch of 17 ft. 3 in., and a

surface area of 45 square feet. The mean results of the four hours' run under forced draught were:—Steam pressure, 152 lbs.; vacuum, 23 in.; revolutions, 143½; total indicated H.P., 4,838 starboard and 4,803 port, giving a collective power of 9,641 horses, or 641 beyond the contract. With an ample supply of steam the power was well sustained throughout the trial, for while the maximum reading gave 9,976 horses, the minimum never sank below 9,475. Notwithstanding the high power developed by the engines, the speed fell slightly short of the estimate, the mean of four runs on the measured mile being 19·594 knots, while the patent log showed that 78·4 knots had been covered in the course of the trial. It is intended to push the *Melpomene* forward as speedily as possible, in order that she may take part in the forthcoming inspection by the German Emperor.

The trial of the *Melpomene* concluded the contractors' official trials of the whole of the "M" class of ships. The various trials have thrown a large amount of work upon the officers and men of the Portsmouth Steam Reserve, which can only be realized by those who have had to conduct so extensive a series of tests under modern conditions of forced draught and high speed of engines. The net result of the runs under way is that, with 9,000 indicated H.P., the class may be practically considered as 19-knot vessels, or a knot short of their estimated or designed speed. There need, however, be little wonder at this falling off, when it is considered how much has been attempted in the class. It may also be mentioned in connection with the "M's" that in every ship tried at Portsmouth the engineers have been compelled to increase the fire-bar surface in order to obtain the contract power.

### THE "MEDUSA'S" SCREW TRIALS.

THE *Medusa*, second-class cruiser, having concluded her screw trials in Stokes Bay, has returned to Chatham from Portsmouth. The *Medusa* and *Medea* were designed to realise a speed of 20 knots with an I.H.P. of 9,000, but as neither these ships nor any of the sisters of the "M" class attained the estimated speed on trial, though in every case the contractors gave more than the guaranteed engine power, it was determined to submit the *Medusa* to a series of experiments under the superintendence of Mr. Robert H. Humphrys, of the firm of Messrs. Humphrys, Tennant & Co., the manufacturers of the engines. The same difficulty was experienced in the case of the *Iris* and *Mercury*, designed for exceptional speed, and it was not until various patterns of propellers had been tried that results adequate to the expenditure of power were obtained. The French have also had to encounter the same problem with their fast cruisers, and as a matter of fact science appears to be wanting in its usual foresight in determining the precise relations of area and shape of screws to the particular form and displacement of ships. In these circumstances recourse has been had to experiments with models at Haslar, but the results have not been satisfactory, since the propellers which proved effective in the tank failed when tried on a ship at sea. The *Medusa* was steamed with three patterns of experimental three-bladed screws, a fact which, combined with the circumstance that a perfect solution of the difficulty remains still to be achieved, is sufficient to demonstrate that much remains to be discovered with respect to the action of screw propellers. The blades of the screws, though attached to the same bosses, were of different forms and areas, and the vessel was driven at 8, 12, 16, and 18 knots, and also at full speed. The first screw tested had a diameter of 12 ft. 3 in. and a mean pitch of 17 ft. 3 in., when, with 9,975 H.P., a speed of 19·574 knots was realised. The second screw, with 13 ft. 6 in. diameter and 17 ft. pitch, and with 10,011 H.P., gave a speed of 19·924 knots. Finally, the third screw had a diameter of 12 ft. 3 in. and a pitch of 17 ft. 3 in., and gave a speed of 19·717 knots with 9,901 horses. As will be perceived, the best results were obtained on the second trial. On this occasion the *Medusa* may be said to have come up to her designed speed of 20 knots, but this was achieved with upwards of 1,000 horses in excess of what was specified in the contract. It also remains to be remarked that the propellers which gave the best results at the highest speed failed to produce the best results at the lowest speeds. The new *Medusas* are to be 25 ft. longer, and it may be hoped that with the additional size and the increased length of the stern shafting extra speed may be readily gained.

## DELTA METAL.

Extract from the "Schweizerisches Gewerbeblatt," June 8th, 1889.

At the time when the first locomotive engines of the Pilatus Mountain Railway were being constructed by the Schweizerische Lokomotiv und Maschinenfabrik, the question arose to find a material which could be cast, and at the same time possessed not only a very great tensile strength, but also great elasticity. Delta Metal being the only material answering these requirements, the worm wheels of the break-gear (16 in. diameter) for the first engines were made of this material. These worms gave complete satisfaction; 18 more were supplied, and the pinions were also ordered to be cast in Delta Metal.

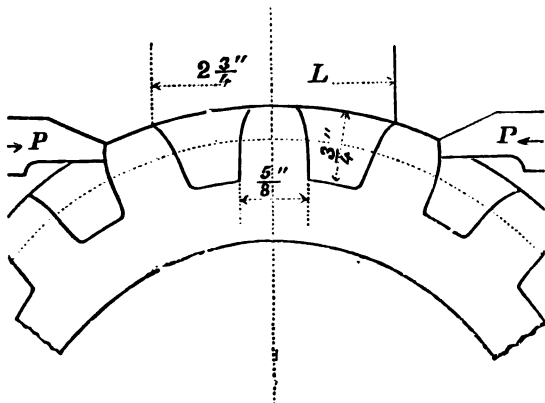
For testing the strength of each casting separately, a test bar was formed with the pattern moulded, and cast along with it in one piece; the bars were then cut off and tested by Professor Tetmayer, of Zurich, the results showing a tensile strength of from  $21\frac{1}{2}$  to  $23\frac{1}{2}$  tons per square inch, with an elongation of 40 to 30 per cent. on a length of  $7\frac{1}{2}$  inches. Besides these tests, the constructor of the Pilatus Railway, Captain Locher, had the following direct test made:—

One of the Delta Metal pinions having been in use for a long time, the teeth had worn off about one millimeter (1.32 inch), so that the thickness at the foot was  $\frac{5}{8}$  inch, and at the top  $7\frac{1}{16}$  inch, by a breadth of  $4\frac{1}{2}$  inch. It was then tested to show how much force would be required to break such a tooth, the strain acting upon it under as unfavourable conditions as in reality are never experienced.

As shown in the following sketch, the pinion was put in the testing machine between two clamps, acting on the entire breadth of the top of the teeth. The test made by Professor Tetmayer shows the following results:—

P: 5 9 10 12 14 15 16 17 18 19 20 21 21½  
 Δ L 0 0.015 0.019 0.039 0.098 0.133 0.169 0.208 0.244 0.285 0.354 0.472 broke.

P indicating the stress in tons, and Δ L the shortening in decimals of an inch of the distance, L originally measuring  $2\frac{3}{4}$  inch.



Both as regards P and Δ L the results were unexpectedly favourable.

The Vitznau Rigi Railway Co., after making satisfactory tests in 1887 with two Delta Metal pinions, put in six more in the course of last year. The introduction of Delta Metal axle boxes for the engines of the Tösztal Railway Co. gave also very good results.

Every engineer knows the difficulty to get hydraulic presses tight, even when made of the best bronze, and working at a pressure of not more than 200 to 300 atmospheres. If they, however, are made of Delta Metal, they will not show the slightest trace of sweating, even at a pressure of 500 to 600 atmospheres, on account of the extraordinary density of Delta Metal.

COLOUR-BLINDNESS IN SEAMEN.—The Board of Trade have appointed a departmental committee to inquire into the system of tests now employed for detecting colour-blindness in seamen and officers of the mercantile marine, a system which is stated to be dangerously incomplete.

## PARIS EXHIBITION.

THE FARNLEY IRON COMPANY, LIMITED, LEEDS.

ONE of the most interesting stands in the British Sectional exhibits in the Machinery Hall is that of the Farnley Iron Co., Limited, Leeds. It is situated in the North Avenue, and is under the charge of the company's agent, M. Jacques Pérès, of 46, Boulevard Magenta, Paris.

The exhibits of this well-known company are of a varied character, and illustrative of their extensive operations in coal, iron, fireclay, etc. It may not be generally known that the works of the Farnley Iron Co. were established in the year 1844, and that it is a self-contained firm, by which we mean that the raw materials, coal, iron, and fireclay, are worked from the company's own estate, 2,000 acres in extent. The Farnley Co. also own the railways extending from their various mines (for carrying the material and fuel) to their works. Their coal, known as the "Better Bed" seam, is found in close contiguity to the fire-clay, and it is remarkably free from impurities, making first-class coke for smelting and refining purposes. The iron ore is of exceptionable purity, and doubtless it is largely due to these natural advantages that the various specialities of Farnley have such a world-wide renown. Skill, care, and the judicious expenditure of capital has, however, not been wanting. The smelting operations, by which in cold blast furnaces a pig-iron of a peculiar kind is produced, which is suitable for steam-engine cylinders, chilled rolls, and similar purposes where strong, tough, close-grain castings are required, are noteworthy, and to those hitherto unacquainted with this material an inspection of the samples of pig and manufactured iron exhibited will be full of interest. Of the "Best Yorkshire iron" it is scarcely necessary to enter into detail, so long as it has been known as a brand equal to "Lowmoor." It may, however, be stated that the cold-blast pig-iron already referred to is exclusively used in its manufacture. Despite the vast extent to which Siemens-Martin steel has been adopted in engineering circles, Farnley iron continues to be exported to all parts of the world, and in such deservedly high esteem is it held by engineers of every branch, that during the last year the price freely paid for it was double that of the best Staffordshire iron.

The Farnley Iron Co., Limited, have, however wisely not remained content with merely continuing to produce their special brands, they have moved with the times to suit customers' requirements, and have attained equal success in the manufacture and manipulation of mild steel, and besides have, as all our readers well know, introduced into use an improved form of Corrugated Furnace for high-pressure boilers;



large numbers of which are now being used in marine boilers for working pressures up to 160 lbs. per square inch. Having previously described these furnaces when exhibited at Newcastle-on-Tyne in 1887, a detached reference to them is no longer necessary.

Several models of these specialities are shown on the Farnley Iron Co.'s stand, including one of a boiler front, with three of the Farnley furnaces fitted. A full-sized flue, 6 ft. long, with a strip cut out to show the sectional area is also exhibited, and shows the perfect character of the material and its skilful manipulation.

As already indicated, a number of the exhibits of the Farnley Iron Co. relate to manufactures of fire-clay. Many of these are of interest to shipowners,

fire-clay material of various shapes for metallurgical furnaces, retorts for gas-making, etc., all of more or less interest to our readers, are also exhibited. Limits of space preclude a detailed reference to the Farnley Iron Co.'s exhibits, but sufficient has been said regarding them to show that they are of a representative character, and deserving of special mention.

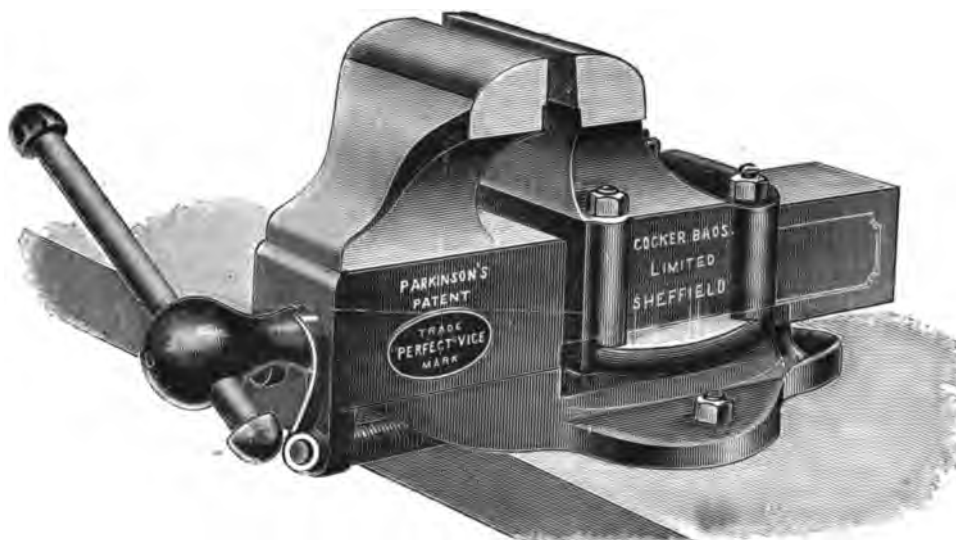


FIG. 1.

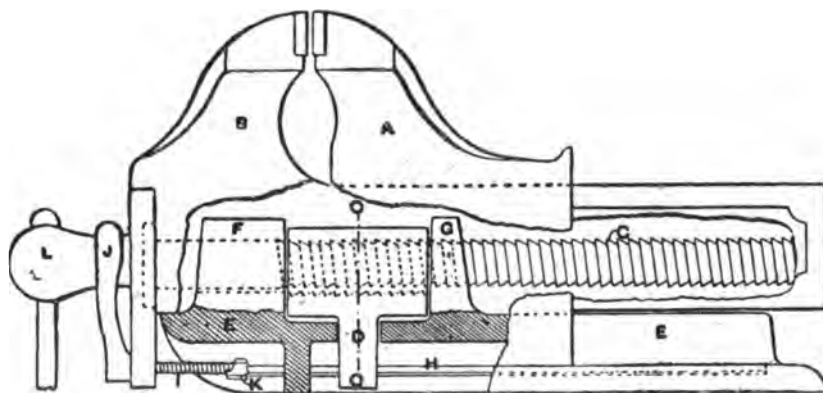


FIG. 2.

shipbuilders, marine and other engineers. Glazed bricks and tiles for use in bath-rooms, lavatories, etc., in passenger vessels are exhibited, of white and various colours, as also porcelain baths, and glazed sinks. The Farnley fire-clay being capable of enduring intense heat, makes it especially suitable for combining with porcelain enamel, and the exhibits of this nature shown are of a very high class finish, and worthy of close inspection. Our attention was specially attracted by the ornamental bricks and enamelled painted panels, being highly suitable for decorative purposes in smoking rooms, saloons, etc., in mail, passenger, and other steamers. Specimens of bricks and sections of

#### TOOLS AT THE PARIS EXHIBITION.

##### PARKINSON'S PATENT "PERFECT" VICE.

**M**R. J. PARKINSON, General Machinist, Chester Street, Horton Lane, Bradford, has a small but well-arranged stand, in close proximity to the Farnley Iron Co., Limited, of Leeds, exhibits, on which are shown a variety of Parkinson's Patent "Perfect" Vices, suitable for shaping, planing, milling, and other machines, and for bench use. As the principles upon which these various vices are designed are alike, an illustrated description of the latter type, specially constructed for engineers, must suffice.

Parkinson's Patent "Perfect" Vices combine sudden grip, together with the advantages of the ordinary screw vice, and give increased "gripping" power. In Fig. 1 we show a general, and in Fig. 2 a sectional view of this improved vice, and from these illustrations it will be seen that a travelling jaw is provided which can be moved or slid with one hand any required distance, so as to be instantly brought into contact with the work to be held, and the jaw further closed upon it, to any extent by the screw as in the ordinary vice. Some of the other instantaneous vices in use are wanting in effective "cramping" movements, and only capable of contracting the jaw about 3-16ths of an inch by a lever; others give only a short screw traverse with a sudden grip, and some prevent the holding of certain kinds of articles because the lever which applies the grip can only move within a very limited radius. In Parkinson's Patent "Perfect" Vice—which is a parallel one—the screw (C) travels with the front of the jaw (see Fig. 2); both the screw (C) and the nut (D) being formed with "buttress" thread in such a manner that great power and security to the grip is ensured with little friction, and consequent ease to the workman. The nut (D) has its upper portion cut away, and is made of sufficient length to give ample strength and durability. The screw cannot be strained, and the nut follows up the wear and tear between itself and the screw, so as to preserve a "perfect" fit of the one to the other, and both are protected from dirt, filings, or damage, so that with long and continuous work no deterioration is apparent.

The mode of "opening" the vice is as follows:—Grasp the knob (L) of the screw (see Fig. 2), at the same time compressing the lever (J). The nut (D) is simultaneously moved out of gear with the screw, and the jaw pulled out to receive the work, then slid into contact with it. On releasing the knob and lever, the nut instantly engages with the screw, and the grip is applied by the vice pin, as in all ordinary vices. It should also be noted that the screw may be used to move the jaw its entire distance of travel, so that all sorts of material and work may be securely held. These vices are made in various sizes, varying in weight from 2 lbs. to 120 lbs.; and, as already indicated, vices of similar design and construction are made for machines as well as for wood-working purposes. As shown in our illustration, Fig. 1, Parkinson's Patent "Perfect" Vice is permanently fastened to the bench, but it can be fitted, swivelled on a centre bolt, so as to be movable to any angle. M. Jacques Pérès, Ingenieur, 46, Boulevard Magenta, Paris, is the sole agent for France, Belgium, Holland, Spain, and Portugal for this speciality, which has already an extensive and widely-established reputation.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from June 25th to July 24th, 1889.  
 Agnew, John W., engineer (lent) to the *Warspite*.  
 Aston, Samuel, engineer to the *Black Prince*, to date July 19th.  
 Barrett, R. H., staff engineer to the *Blenheim*, to date July 4th.

Basson, Harry, assistant engineer (lent) to the *Rupert*, to date July 24th.  
 Bromley, Wm., (b) engineer to the *Goldfinch*, to date June 29th.  
 Carut, Edwin C., engineer to the *Undaunted*.  
 Curtis, F. T. W., engineer to the *President*, additional, for service at Woolwich, to date July 19th.  
 Davis, Fredk. C., assistant engineer to the *Rodney*.  
 Edwards, Wm. P., assistant engineer (lent) to the *Warspite*.  
 Ellis, J. H. W. H., engineer to the *President* for service at the Admiralty, to date July 25th.  
 Ellis, Matthew W., chief engineer to the *Comus*, re-appointed on promotion.  
 Fielder, John, chief engineer to the *Barracouta*, re-appointed on promotion, to date July 2nd.  
 Fussell, John S., engineer to the *Research*, to date July 12th.  
 Godbeer, Samuel, engineer to the *President*, additional, for services at the Admiralty, to date July 25th.  
 Hancock, Wm. J., fleet engineer to the *Rodney*.  
 Hart, Alfred, engineer (lent) to the *Rodney*.  
 Harvey, John R., fleet engineer to the *Warspite*.  
 Hillyer, Fredk. A., engineer to the *Firebrand*, to date July 19th.  
 James, Charles R., engineer to the *Traveller*, to date June 29th.  
 Jennings, Robert S., assistant engineer to the *Rodney*.  
 Lister, Francis H., assistant engineer to the *President*, additional for service in Comptroller's Department, to date July 18th.  
 Mabb, Wm. J., engineer to the *Humber*, to date July 2nd.  
 Martell, Percy D., assistant engineer (lent) to the *Warspite*.  
 Moysey, John, staff engineer to the *Bacchante*, to date July 19th.  
 Nibbs, Charles W., fleet engineer to the *Monarch*, to date July 19th.  
 Paris, Victor De, assistant engineer, probationary (lent), to the *Rupert*, to date July 24th.  
 Parsons, Wm. R., assistant engineer to the *Hero*, to date July 19th.  
 Pill, Jos. H., engineer (lent) to the *Warspite*.  
 Raper, Robt. S. J., assistant engineer (lent) to the *Davastation*.  
 Robins, John J., chief engineer to the *Wye* (re-appointed on promotion).  
 Sullivan, Geo., fleet engineer to the *Hotspur*, to date June 29th.  
 Thumwood, Lewis E., engineer (lent) to the *Rodney*.  
 Wheeler, Richard J., staff engineer to the *Tamar*, to date June 26th.

### HOAR & BROWN'S HARDWOOD MARKET REPORT, July 24th, 1889.

TRAK.—The deliveries for the last four weeks ending the 19th inst. have been no less than 2,130 loads, and for the half-year ending June, 7,021 loads, against 8,049 loads in 1888, and 6,148 loads in 1887.

The Stock on the 1st inst. was:—

1889.		1888.		1887.	
Logs.	Planks.	Logs.	Planks.	Logs.	Planks.
Moulmein 8,034 Lds.	767 Lds.	5,934 Lds.	771 Lds.	7,555 Lds.	450 Lds.
Rangoon - 1,340 "	291 "	1,067 "	190 "	1,327 "	199 "
Bangkok - 1,238 "	890 "	1,227 "	811 "	2,603 "	547 "
Totals - 5,602 Lds.	1,388 Lds.	8,228 Lds.	1,772 Lds.	11,885 Lds.	1,196 Lds.

The four weeks' deliveries are especially important as being the heaviest we have had for many years, even if they are not the largest we have ever had from London. This must show that our market is in a very flourishing condition, and judging from prices obtained, it is still gradually going up.

GREENHEART.—This branch is at a standstill. The deliveries are next to "nil" and the stock very small, about 150 loads against 556 loads last year.

MAHOGANY.—Stocks have considerably decreased during this month, and this has a tendency to strengthen the market. Very small stocks are being held either by dealers or brokers, and those who are holders of anything good are asking full prices.

The next Tobacco at Public Auction will show a marked difference in values, and will no doubt prove a great disappointment to those who have been waiting for falling markets to fulfil their contracts.

WALNUT WOOD.—The market for logs is still dull, little or no demand showing itself, prices are therefore considerably weaker.

Imported planks and boards are going very fairly, a large demand existing for good average quality and sizes, upon which increased prices are now obtainable, showing a good profit to shippers.

**WHITWOOD.**—Logs are moving slowly at low figures, and few transactions are reported. Planks and boards are more active, especially the former, large quantities having lately changed hands, although at somewhat reduced prices.

Stocks are not large.

**QUEBEC ROCK ELM.**—A few parcels have been taken into stock, but as they were generally of an inferior character, the expectation of ready sales which was anticipated has not been realised.

Irish wood of good quality is much in demand.

**OAK.**—The high prices which are being asked greatly restrict business in this wood, and there is consequently nothing fresh to report.

## INDUSTRIAL AND TRADE NOTES.

### THE CLYDE AND SCOTLAND.

**WORK** has been resumed after the holidays in the ship-building and engineering establishments of the Clyde, and it is gratifying to record that the rivetter's strike, which had lasted for the better part of two months, is now at an end. The threatened lock-out has thus been averted, and labour has been resumed under a sense of general thankfulness and most encouraging prospects for the future.

The settlement of the dispute was effected at a conference of representatives on the side of both masters and men on the 10th July. The conference, it may be stated, lasted from noon until after eight o'clock in the evening. The lists submitted by both parties were considered in detail, and mutual concessions on a large scale made. As the ultimate result, an agreement on almost similar lines to one previously adopted at Clydebank, was drawn up and signed. It refers only to ordinary work, and will remain in force for a period of six months.

During the course of the dispute there has necessarily been a very marked cessation of tonnage output, but latterly, in view of the approaching holiday period, builders seemed to make an extra effort to consign new vessels to the water previous to stopping work. Altogether, new tonnage to the extent of some 20,000 tons have been launched during the past four weeks, several of the vessels being of considerable size. One of these, noteworthy in other respects besides that of dimensions, was the screw steamship *China*, launched from the stocks of the Fairfield Shipbuilding Co., for the Pacific Mail Steamship Co. This large vessel, 460 ft. in length over all, and of about 5,200 tons gross register, marks a new departure in the history of the Pacific Mail Steamship Co., a line which is second only to the Cunard company in the date of its inauguration. Hitherto this company, the members of which are mostly all American citizens, have had all their vessels built in America; though occasionally of late the engines have been supplied from this country. Finding this an inconvenient arrangement, however, they resolved, after much consideration, to have both hull and engines made on the Clyde, and the *China* is the result of that determination. This swift, powerful, and splendidly-appointed steamer is intended for the company's San Francisco and China service.

Another of the larger vessels launched during the month was *Rei de Portugal*, of 3,400 tons gross measurement, built by Messrs. Scott & Co., of Greenock, for the Mala Real Portuguese of Lisbon, for mail and passenger service between Lisbon and the Portuguese Colonies in Africa. This vessel is the second of a fleet of five steamers building by Messrs. Scott & Co. for the same service. A third steamer launched, of which notice may be taken, was the *Bayonne*, of 3,000 tons, adapted for carrying in bulk over 4,000 tons of oil. This vessel left the stocks of Messrs. A. and J. Inglis, of Pointhouse, and is for the Standard Oil Co. of New York, for petroleum carrying between the United States and the company's depôts in London, Liverpool, Bristol, and Hull.

Few fresh contracts for steamers have been entered into since last month's notes were written, but the work presently on hand being so backward, owing to the protracted strike, will be sufficient to keep the yards well employed for several months.

<sup>1</sup> Although there is a very marked cessation of contracts for new

merchant steamers, this regrettable circumstance has a cheerful set-off in the fact of the Government contracts just entered into. Definite particulars have not transpired at present writing, but there seems to be no doubt that the orders for at least seven of the seventeen second-class cruisers, for the construction of which the Government invited offers from private shipbuilding firms, have been placed with Clyde builders. The tenders for the construction of five of the first-class cruisers have also been issued. The vessels, it is understood, will be about 7,000 tons displacement each. It is hoped that a share of this work also will come to the Clyde, though only the more important firms will be in a position to undertake the construction of such heavy vessels.

Messrs. Kincaid & Co., Limited, of Greenock, contracted during the month to supply the engines, boilers, and other machinery for a screw steamer to be built by Messrs. Murray Brothers, Dumbarton.

Two powerful dredgers were launched from Clyde yards during the past month. One was a twin-screw dredger of 600 tons built by Messrs. Fleming & Ferguson, Paisley, to the order of Mr. T. A. Walker, contractor for the Manchester Ship Canal, and the other a patent hopper dredger of 800 tons hopper capacity, built by Messrs. Simons & Co., Renfrew, to the order of the Harbour Department, Board of Trade, Whitehall, to be employed in dredging Ramsgate Harbour. Messrs. Simons & Co. have in progress two powerful dredgers for the Melbourne Harbour Commissioners, and a hopper dredger to be employed in the removal of the bar at Alexandria Harbour, also a patent elevating ferry steamer for cross-river communication at Finnieston, Glasgow.

At Kinghorn Messrs. John Scott & Co. recently launched a fine steel paddle steamer for the General Steam Navigation Co., London, which is expected to attain the speed of 20 miles an hour. She is one of five built at Kinghorn within the past few years for this company, and in many respects the finest of them all.

Messrs. Ramage & Ferguson and Messrs. S. and H. Morton, of Leith, each launched, on successive days, a steel screw steamer of over 200 ft. in length. Messrs. Ramage & Ferguson's vessel was built to the order of Messrs. R. Conaway & Co., of Liverpool; and for the same company the builders have in the stocks a duplicate steamer almost ready for launching.

The congested state of traffic at Glasgow Harbour, caused by the strike of seamen and firemen on the Clyde, has had the effect of inducing shipowners to look at the resources of other ports on the Firth for the discharging and loading of their vessels. The great facilities and ample accommodation available at the James Watt Dock, Greenock, have thus attracted some of the leading shipping lines trading between Glasgow and New York. After some weeks of experience there is quite an evident disposition on the part of some to make Greenock the point of departure for their steamers. Long before the strike of seamen and firemen took place, indeed, one of the Transatlantic lines seriously contemplated removing their staff and plant to Greenock, and making it their future loading port. During the course of the strike the State Line Steamship Co. made practical experiment of the facilities offered at the James Watt Dock, and the result of that experiment will no doubt largely determine what their future operations will be. With the State Line Steamship Co., the Anchor Line are apparently realising the advantages possessed by this large dock, and lately two of the principal officials of the Anchor Line, along with several members and officials of the Greenock Harbour Trust, visited the Watt Dock, and were shown its capabilities for working a large Transatlantic trade. The Anchor Line Co. representatives seemed well satisfied with the accommodation provided, and the negotiations now going on between them and the Harbour Trust may result in the Anchor Line Co. giving the dock a trial. If they do, it will not be the fault of the Greenock Harbour Trust or their officials if the trial does not lead to a closer connection between the Anchor Line and Greenock. Other shipping lines have been giving the Watt Dock a trial, and altogether it would seem as if the stigma of "Greenock's white elephant" were to be at least partially removed from this magnificent dock.

It was with feelings of the deepest regret that Clyde people received the news of the death of Mr. Robert Duncan, of Port Glasgow, which sad event took place on the 3rd July. Mr. Duncan was in his 62nd year, and for many years held a foremost position in the shipbuilding trade, and was a recognised authority on everything pertaining to it. Three of his sons will carry on the shipyard at Port-Glasgow.

## TRADE NOTES FROM THE TYNE, WEAR, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—It is at last definitely understood that at least two Tyneside firms have been successful competitors for part of the Government work now being given out. These are Messrs. Palmer & Co., and Sir W. G. Armstrong, Mitchell & Co., the former of whom have secured orders for three cruisers of the second class, the construction of which will be commenced as soon as practicable. We were in a position to give particulars respecting the dimensions, &c., of these vessels in last month's report, and as information subsequently obtained, shows the details then given to have been substantially correct, it is unnecessary to repeat them here. Messrs. Palmer will manufacture, in their own works, the whole of the steel required for the construction of these vessels, and in this they have an important advantage over other recipients of the Admiralty contracts, inasmuch as they are less likely to be obstructed in the building, by having to wait for supplies of the principal material used. An impression exists that Messrs. Palmer will also be entrusted with the building of one of the first-class, heavily-armoured battle-ships which constitute the leading feature of the new Government programme, and whether the expectation turns out to be rightly founded or otherwise, it is at all events quite certain that work of this class is not beyond the capacity of the firm to cope with. Messrs. Armstrong, Mitchell & Co., have been successful in getting two of the swift cruisers to build, and as they have already eight vessels of a similar type on the stocks, it is quite clear that their Elswick yard (which is exclusively devoted to the building of war-ships), will be kept busy enough for some time to come. It is almost certain, however, that this firm will be selected to build one or more of the heavy-armoured vessels that are provided for in the recent £21,000,000 vote, and in anticipation of this event coming to pass, the great resources of the Elswick yard are now being pretty extensively added to. It has not transpired up to the present, that Messrs. Hawthorn, Leslie, & Co. have obtained any of the new Government contracts, but it may be stated that the firm have now in course of execution an Admiralty order for two war-sloops, one of which is already advanced to the plating stage. The firm have several other vessels, most of which are of special design, in course of construction, and a larger number of hands are now employed in the yard than perhaps at any former period of its history. Messrs. Swan & Hunter have recently reduced the number of building berths in their West yard from four to three, by which means they are now enabled to build simultaneously three vessels of a very large class. Having room for other two vessels in their East yard, it will be seen that their building accommodation is quite on a par with that of any other firm in the district, excepting, of course, the three previously mentioned, which have long and deservedly held the position of being the leading firms on the Tyne. Messrs. W. Richardson & Co. have put down the keel for another first-class steamer in the berth vacated by the launch of the twin-screw passenger steamer *Acuña*, which took place a couple of weeks ago. The firm have three other large vessels in progress. Messrs. W. Dobson & Co., who hitherto have only had three building berths in their yard, are now making the necessary arrangements for the formation of a fourth berth, and will, it is understood, increase the working plant accordingly. The management of the Tyne Shipbuilding Co.'s yard have, with characteristic readiness to adopt new improvements of proved utility, ordered for their establishment at Howdon, one of the new countersinking machines, which render the moving of plates during the process of countersinking, unnecessary. In the whole of the other building yards, and also in the repairing establishments, a very high state of activity continues to be maintained. The wages of shipbuilding operatives were advanced 5 per cent. at the beginning of the month, but it may be recollected that this advance was arranged for so far back as February last. The wages of platers' helpers were also advanced from 30s. 6d. to 32s. per week in the case of furnace-men, and from 27s. 6d. to 29s. per week in the case of outside men.

**Engineering.**—The activity in the marine engineering establishments shows no signs of diminution, and the maintenance of night work in the principal departments is the universal rule. It is understood that both Messrs. W. Richardson & Co. and Messrs. Palmer & Co. are engaged in con-

structing quadruple engines of special design at their respective establishments. Messrs. Hawthorn, Leslie & Co. are engineering, at their St. Peter's Works, the large steamer *Nairnshire*, recently launched for Glasgow owners from their Hebburn Yard. Messrs. Ernest Scott & Co. have just completed the fitting with triple-expansion engines of the s.s. *Peace*, and the firm have now on hand several other contracts of a similar kind. The extension works which were lately commenced by this firm are being pushed forward with great rapidity, and will doubtless be ready for productive uses long before the end of the year. Messrs. Carrick and Wardale continue to have a large demand for their steam feed, bilge and ballast pumps, and the works of Messrs. Emerson, Walker & Thompson Brothers, Dunston, are kept as busy as possible on orders for their patent direct steam windlasses and other specialities. Mr. Thos. Boydell, of 27, Bath Lane, Newcastle, who recently commenced business as manufacturer of engine and steering telegraphs, has just completed a set of very superior telegraphs for the s.s. *Elise Marie*, built by Messrs. Armstrong, Mitchell & Co., and engined by the Wallsend Slipway & Engineering Co. The establishment is kept busy on other orders lately obtained. Messrs. Allen and Robson, 30, Dean Street, Newcastle, have become the agents for the sale of the new "Magnolia Anti-Friction Metal," and have achieved very marked success in introducing the article to the notice of local consumers. This is scarcely, to be wondered at, seeing that the excellence of the metal, as a medium for keeping journals cool, is vouched for by a great many trustworthy authorities, who have tried and tested it in all descriptions of machinery, and under almost all conceivable conditions. Messrs. Allen & Robson have already supplied considerable quantities of the metal to the leading engineering, shipbuilding, and steel and iron manufacturers in this locality, and are finding the demand so rapidly on the increase, that they have determined to appoint sub-agents at the principal centres of their extensive district, which comprises the whole of the North-East coast. Messrs. George Angus & Co., of the St. John's leather and indiarubber works, have a great many Government and other contracts of an important kind in hand, and are consequently utilising to the utmost possible extent, the whole of their large resources. Their noted speciality, "Amianthus cloth packing" for triple-expansion engines is particularly in request, and the demand for it is steadily increasing. The steel works of Messrs. John Spencer & Sons, at Newburn, continue to show great activity, and the Ouseburn forge, belonging to the same firm, is also kept going very briskly. The Tyne Boiler Works Co., Low Walker, are well supplied with orders just now, but owing to their superior facilities for turning out work, they get through contracts very rapidly; and were it not for the constant influx of new orders, their powerful machinery and plant would very often be only partially employed. The rope works of Messrs. Dixon & Corbitt, and R. S. Newall & Co., Limited, are exceedingly busy, the orders in hand being both numerous and important. This enterprising firm have quite unique resources at their command, and it is satisfactory to note that they are being fully and constantly utilised.

**Electric Lighting.**—Messrs. J. H. Holmes & Co., electric light engineers, keep extremely busy in the manufacture of their "Castle" dynamos, and other electric lighting apparatus. They are now finding it necessary to make an extension of their works, in order to more promptly meet the steadily increasing demand for their specialities. The building operations have been already commenced, and when completed, will, it is estimated, double the productive capacity of the establishment. Messrs. Holmes have just now no less than 17 steamers to fit with the electric light, and a large proportion of them are to have the firm's slow speed dynamos coupled direct to the engine shafts. This system is coming into much favour, being safer and more compact than the belt-driven arrangements. Among the ships mentioned, there are two large Brazilian vessels, and one Russian vessel, all having extensive passenger accommodation, and now in course of building at Messrs. Hawthorn, Leslie & Co.'s yard, Hebburn.

### THE WEAR.

**Shipbuilding.**—Some disappointment has been felt in this district owing to the fact that out of the 17 cruisers of the second class that have just been apportioned by the Admiralty officials among leading shipbuilding firms at different centres, none have been allotted to the enterprising builders on the Wear

who had tendered for them. It is felt that the capacity for building vessels of this description is as manifestly existent in this district as in any of those whose claims appear to have received greater consideration, and surprise is freely expressed that a river whose aggregate output of tonnage in the busiest year of the last busy period, was only second to that of the Clyde, should be persistently ignored when Government work has to be done. It cannot be denied, indeed, that some splendid specimens of passenger and cargo boats have been produced in the building yards of the Wear, and it is not too much to assume that their proprietors only want the opportunity given them, to prove that they can build war ships—of the lighter class at all events—as well as their neighbours. The wages of the shipyard operatives in this district were advanced at the beginning of the month to an equal extent with the wages of the same classes on the Tyne. A slight misunderstanding arose as to the exact date on which the advance should commence, but at a meeting of the employers with the workmen's representatives matters were speedily adjusted, and though a stoppage of work took place in some of the yards, it fortunately was not allowed to assume the ordinary characteristics of a strike. The platers' helpers applied for an advance of 5 per cent. in the wages rates of both outside men and furnace men, but the employers decided to give the advance only to the latter, as the former were already in receipt of a rate of wages equal to the advanced rate just agreed for on the Tyne. The intimation was conveyed to them, however, that if they chose to affiliate themselves to the Conciliation Board, they could, if they considered they had any special grounds for claiming an advance, bring the matter before that body for adjudication and settlement. At the time of writing, arrangements are being made for the re-opening of the principal entrance to the Sunderland Docks, which has been closed for two or three years while the process of increasing the width by several feet was being carried out. It is understood that the s.s. *Mombassa*, which was built by Mr. James Laing for the British India Steam Navigation Co., and which is now receiving the finishing touches beside Mr. Laing's yard, will be the first large steamer to pass through. Messrs. J. L. Thompson & Sons have just now got one of their six building berths unoccupied. This is the first time for a couple of years that any of their berths has lain vacant for a week or more, and though the circumstance may not have any special significance as regards the diminution of prospective work, it may on the other hand, possibly turn out to be the first indication of a lightening of the abnormal pressure that has existed for some time past. Messrs. Bartram & Haswell have at present two very large vessels on the stocks, and the Sunderland Shipbuilding Co., whose yard adjoins that of the firm just mentioned, have four boats of very considerable dimensions in progress. This firm have launched a large amount of tonnage—mostly for foreign owners—this year, and their marked success in this respect, is in no small degree owing to the pneumatic system of rivetting which was adopted by them some time ago for frame and beam work. Messrs. De Bergue & Co., of Manchester, who supply this system, may well be congratulated upon the very satisfactory results achieved in this instance. Messrs. Short Brothers, who have built a large proportion of the vessels belonging to the Prince Line, have now several other orders in course of execution for the owners of that well-known fleet of steamers. They have also vessels on the stocks for other important local partnerships, and their establishment continues to be one of the very busiest in the district. Messrs. W. Doxford & Sons have four vessels, nearly all of which are of large tonnage, on the stocks, and their output for the current twelve months is expected to considerably exceed that of last year. Messrs. R. Thompson & Sons have the whole of their available building space occupied, and their repairing department is kept well provided with work.

**Engineering.**—Though the marine engineering firms on the Wear have plenty of orders on their books, the difficulty of getting supplies of castings, &c., is still keeping some of the establishments less active than they might be. The new foundry which has been started at Monk Street, Monkwearmouth, and which was incidentally referred to in last month's notes, has, however, already become a source of supply for the smaller castings, and this will, to some extent, lessen the inconvenience felt. The work of preparing the place for the commencement of operations was carried out in an incredibly short space of time, and the circumstance reflects the greatest credit on those who had charge of the undertaking. The arrangements for producing the heavier class of castings are,

it may be added, nearly completed. Mr. John Dickinson is now engaged in engineering a large vessel recently launched from Mr. Laing's yard, and in addition to the other new contracts in hand, his establishment is kept very busy with repair work, and the fitting up of Dickinson's patent crank shafts. Mr. William Allan is putting a set of his specially designed quadruple engines, with boilers to work up to 200 lbs. pressure, in the large steamer *Parahyba*, built by Messrs. Doxford & Sons. This is the first complete set of engines of this improved type that has been fitted in a vessel by Mr. Allan, and the trial, which may be expected to take place very shortly, will be looked forward to with more than ordinary interest. Messrs. John Lynn & Co., of the St. Luke's Engine Works, Pallion, have for some time past been making the manufacture of steering gears a special feature of their business, and they have just now a large number of these important deck accessories in hand. Steam winch makers continue very busy, and forges are quite full of work. Rivet-makers are also doing an active business, and local ironworks are kept going without any periods of recurring idleness, such as were very noticeable a couple of years ago. Messrs. Lumsden & Co.'s chain and anchor works are kept fully employed, the patent anchor brought out some time ago by Messrs. Byers & Storey being now much in favour among shipowners. Though great efforts have been put forth to complete the arrangements for the commencement of the steel manufacture at Castletown before the autumn, the difficulties to be overcome were found greater than was anticipated, and it is now apparent that very little will be contributed to the steel supply from this establishment during the present year.

**The Hartlepool.**—Repair contracts of a most thorough and extensive character continue to supplement the plentiful amount of new work in the hands of Hartlepool shipbuilders, and at each of the four establishments overtime and night-work are necessarily being resorted to as the best means for keeping pace with current requirements. In the engineering establishments equal activity is to be noticed, and according to present appearances, it is likely to be continued for many months to come. Since the beginning of June the following ships, engined by Messrs. T. Richardson & Sons, have had highly satisfactory trial trips:—On June 7th, the s.s. *Elba*, owned by Messrs. C. T. Bowring & Co., London, and built by Raylton, Dixon & Co., Middlesbrough. On June 21st the s.s. *Daventry*, owned by Messrs. Sivewright, Bacon & Co., West Hartlepool. On June the 25th the s.s. *Douro*, owned by Messrs. Thos. Wilson & Co., Limited, Hull. On July 12th the s.s. *Scots Greys*, owned by Messrs. Christie & Co., Cardiff. The following vessels have received their machinery at Messrs. Richardson & Sons, Sheerlegs:—The s.s. *Douro*, for Messrs. Thos. Wilson & Co., engines 22½, 37, 61, by 3 ft. 8 in. stroke, with two large single-ended boilers of 160 lbs. working pressure. The s.s. *Ebro*, a sister ship to the last named, and for the same owners. The s.s. *Daylight*, for Messrs. J. Wood & Co., West Hartlepool. Engines, 22, 35, 59, by 3 ft. 3 in. stroke, with two single-ended boilers of 160 lbs. working pressure. The s.s. *Hibernia*, for the International Steam Shipping Co., Whitby, the hull and machinery being under the superintendence of Captain Smith, of Whitby and Cardiff. Engines, 23, 37, 61, by 3 ft. 3 in. stroke, with two large single-ended boilers to work up to a pressure of 160 lbs. The s.s. *Dalmally*, for Messrs. George Horsley & Sons, West Hartlepool, with engines 22, 35, 59, by 3 ft. 3 in. stroke, and two single-ended boilers of 160 lbs. pressure. During the half year ending June 30th, the heavy forgings turned out by Messrs. Richardson & Sons, have amounted to 100,6 tons, consisting of all descriptions of forgings required in ship and engine construction. At the Central Marine Engineering Works business keeps very brisk, and the same may be said of local steel works, rope works, and cement works.

**Stockton.**—The four shipbuilding establishments at Stockton are still as busy as possible, and the engine works of Messrs. Blair & Co. may appropriately come under the same description. The other engineering establishments and boiler works are generally very busy. Large quantities of railway material are now being despatched over sea, from the works of Messrs. Wrightson, Head & Co. Steel and Iron works are very busy, and in this connection, it may be stated that the operatives in the iron trade will receive on August 1st a wages advance of 5 per cent. under the sliding-scale.

**Middlesbrough.**—Messrs. Raylton, Dixon & Co. have no less than eight large vessels under construction in their two yards,

and they have besides a fair amount of repairing work. Messrs. Craggs & Sons are also having plenty of work in both the new and old lines. Messrs. Harkess and Sons have, in the framing stage, a vessel of the partial awning deck type, of nearly 2,000 tons carrying capacity, and they have all but completed the negotiations for building two large steamers, to be employed in the dead-meat trade. Messrs. Westgarth, English & Co., marine and general engineers, continue busy, and some departments of the Tees-side Engine Works are kept steadily going. An advance of 5 per cent. has been made in the wages of the operatives at the Eaton Street Works.

**Darlington.**—The Darlington Forge Company continue to receive inquiries for their special products from shipbuilders and engineers at home and abroad. A steel ingot weighing 35 tons was successfully cast on the 17th inst., and this being the largest casting ever made in the works, the incident was regarded with more than ordinary interest. The ingot is to form part of the connecting rods for the engines of a large steamship building for the North German Lloyd's by the Vulcan Shipbuilding Company, Stettin.

### THE MERSEY.

**M**OST of the engineering shops and shipbuilding yards are now full of work, and the sign of improving trade, with which the new year opened, has since been fully realised, and a number of the shops and yards are working overtime. The marine shops have several large engines on hand for new steamers, now being built either in Liverpool or elsewhere; but the principal work at present is in converting ordinary compounds into triples, and supplying new steel boilers.

As anticipated, the sailors' strike collapsed, and the men are now flocking to the different docks and offices seeking work. The men have been very badly advised throughout, and if the owners had only been approached in a proper manner, and the leaders had not attempted to dictate, the men would, no doubt, have had some concessions granted them.

From the annual statement issued by Mr. W. H. Livesey, chief accountant of the Mersey Docks and Harbour Board, it is evident that the trade of the port during the last year has increased both as regards tonnage and receipts, when compared with previous years. The aggregate tonnage of last year was 9,291,964, being 274,029 tons in excess of the returns for the previous year; the grand total of receipts being £1,062,505, showing an excess of £49,707. Thirty years ago the tonnage was 4,511,969, and fifty years ago it was only 2,158,691. The aggregate tonnage of the vessels trading to the port is over 9,250,000. The vessels paying dock and harbour rates last year numbered 22,662, or 431 vessels more than the previous year. There is a decrease in the number of sailing vessels, and also in the coastwise steamers, but an increase of 537 in the number of foreign-going vessels, the increase in the tonnage of the latter amounting to 945,077. The dock tonnage and harbour rates realised £447,927, being an increase of £34,303; the dock rates on goods amounted to £331,945, showing an increase of £14,031, and the so-called "town dues" realised £251,561, being an excess of £10,571. The graving dock receipts were £29,701, showing a decrease of £2,394; gridiron rates, £267; dock rent, £4,107, being a decrease of £6,755.

### WELSH NOTES.

**T**HE chief event of the month in South Wales has been the opening of the Barry Dock. The ceremony was successfully performed by Mrs. Lewis, of Ferndale, on the 18th ult., and the day was observed as a general holiday in Cardiff. The shareholders are now looking forward to big things. There can be little doubt that the Barry Co. has a very successful career before it, although it remains to be seen whether it will not have a hard fight before long. The powerful companies owning the Cardiff Docks and the Taff Vale Railway are not very likely to stand idly by and allow the 4,000,000 tons of coal which the Barry Co. can tip annually to go past them. Of course it is quite on the cards that we shall, before long, have a war of rates, especially if the Bute Docks and the Taff Vale Co. amalgamate, parliamentary powers for which are now being sought. The South Wales coal trade is, how-

ever, expanding at such a rate that there will eventually be room for both the new and old undertakings to sink disputes and go ahead with their making money. The tussle will be between the arrival of that good time and the commencement of the rate cutting which we expect.

The Barry Dock, as at present constructed, may be looked upon as essentially an export dock. Little, if any, accommodation has been provided for any import trade save that of pit-wood and other timber. In time, however, the necessary accommodation for an increased import trade is to be provided. The dock is said to be the largest in the world, possessing an area of 73 acres. Its length is 3,100 ft., and the greatest width 1,100 ft. At the wider end the jetty runs out into the dock for a distance of some 1,500 ft. The coal tips (17 in number) are erected on the jetty, at the west end and the north side of the dock. What import trade is looked for will be carried on at the south side of the dock, where there will probably be erected, later on, additional coal tips. The railways in connection with the dock are 27 miles in length, although the main line connecting the dock with the coal fields is only 18 miles long. This line joins the Taff Vale at Hafod, to which point the coals for Barry will be carried over the lines of the older company. In addition to the Barry Companies' own line there is at present a Bill before Parliament for the construction of a new line, entitled the Vale of Glamorgan. This line, if constructed, will afford a means of communication between what are known as the Bridgend valleys and Barry.

The cost of the entire Barry undertaking has been about £2,000,000, and it speaks well for the South Wales, or rather Cardiff, coal shippers that they raised the greater part, if not indeed all, of this large sum amongst themselves.

A weekly engineering contemporary recently drew attention to the facilities which existed in South Wales for the manufacture of anthracite iron, and commented upon the fact that by far the greater portion of the large quantities of pig-iron required in the district was drawn from Cumberland. Within the past month we learn that a company are erecting furnaces at Trimsaran near Kidwelly, where the manufacture of anthracite pig-iron will be carried on. We believe there is only one blast furnace in South Wales where anthracite coal is now used, and at the particular furnaces in question it has to be mixed with coke. Owing to the density of anthracite coal, the furnaces to use it entirely should be some 50 or 60 feet high, and should have a much greater blast pressure than is usual in furnaces in this country. Properly managed, the manufacture of anthracite pig-iron should pay exceedingly well.

It appears from the returns of the Swansea Harbour Trust, that the revenue for June was £9,216, against £8,450 in June, 1888. The vessels which arrived during the month numbered 380, with a total register tonnage of 107,403, and they paid in dues £2,409. This compares badly with the corresponding month last year, when the figures were 437, 120,755 and £2,665 respectively.

Some attention is being paid in this district to rumours concerning the possibility of tin plates being shortly manufactured in the United States. It has been stated that the chief object of the consolidation of the North Chicago Rolling Mills Co. and two other large concerns, is to take up this particular trade. The supplies of tin are to be drawn from the Black Hills of Dakota. As the Americans pay about £5,000,000 per annum for tin plates, the greater proportion of which are manufactured in South Wales and Monmouthshire, any attempt to carry on the manufacture in the States cannot but cause attention amongst our local makers. There appears to be some doubt, however, about the existence of the Dakota tin deposits.

Considerable stir has been caused in Bristol since our last issue by two far from pleasant articles which have appeared in London financial papers about the management of the Bristol Docks. The management of these docks has been seriously impeached by the papers referred to; but although it is generally admitted that the criticisms are just, we read that the Docks Committee mean to take no notice of them unless some member of the Council refers to them at the forthcoming meeting of that body. People who know Bristol will not feel so surprised at this as will those who know the "come day go day" policy pursued in connection with the management of the Bristol docks. An examination of the dock accounts of the Bristol Corporation will show that practically every trade carried on in connection with the Harbour works is done at a loss. It may be, by the way, news to some

of our readers that the Bristol pilotage is partly carried on under an Act passed in those good old days when George the Third was king. Any shipowner who has had a vessel at Bristol and Cardiff, or Newport, will at once be able to see the manner in which Bristol is handicapped by the absurd pilotage regulations. Fancy having to take a Bristol pilot, should he offer himself, from Lundy Island! What with pilotage and tonnage, the shipowner incurs a fair amount of harbour expenses before ever he sees Bristol docks.

Since commencing the writing of these notes we have heard a very pretty report about the opening of the Barry Dock. Whilst all Cardiff was invited to the luncheon, where covers were laid for 2,000, and the ceremony which gave an excuse for this great "fuss," and whilst to accommodate the Newport guests a special train was considered necessary, there were only three invitations sent to Swansea. One of these was sent to the Harbour superintendent the day before the ceremony. He very naturally returned the apparently priceless document. The slight is all the more noticeable, seeing that when the East Dock at Swansea was opened by the Prince of Wales, quite a number of invitations were sent to the self-styled Welsh metropolis. Of course Swansea will survive the slight, all the more easily since the slight will be put down to jealousy. To an outsider it would appear that however well educated Cardiff men may be in the art or science of coal shipping, they yet require a considerable amount of polish in the art of reciprocating polite attentions.

The condition of Newport's trade continues to cause much anxiety in that town. It appears from returns prepared by the local Chamber of Commerce secretary that the foreign coal shipments of the first six months of this year amounted to 1,080,947 tons, or 78,395 tons less than were shipped during the corresponding period in 1888. The coastwise shipments showed a decrease of 47,058 tons. Compared to 1888 the general coal shipping trade shows a decrease of 8.1 per cent., and compared to 1889 the decrease is no less than 14 per cent. This is a very serious matter indeed, and it is to be hoped that Sir George Elliott will give a favourable ear to the request of the local shipping people to do all in his power to improve matters. As an example of the manner in which Newport coal shippers are handicapped, it has been stated that the rate on Nantyglo coal to Newport is 15s., to Cardiff it is 15s. 3d., but at the latter port it commands 1s. a ton higher price. If this can be taken as a general thing in connection with Monmouthshire coal, there is no wonder the trade of Newport languishes.

### BELFAST.

ALL the stocks are at present occupied with vessels of large tonnage, and there is every prospect of the latter half of the year being as busy as the first six months. Several of the trades have applications in for a rise of wages. Some disappointment has been caused by the shipbuilders declining to estimate for any of the new Government work; but as such work very seldom comes this way, the specialties make the Admiralty work very troublesome and expensive. The new White Star Liner *Majestic*, lately launched, is now lying in Abercorn Basin, having her machinery put on board.

### LEITH NOTES.

THE shipbuilding industry still shows activity and the prospects for the winter are exceptionally promising. Messrs. Ramage & Ferguson have seven vessels on the stocks and have launched a fine steamer, the *Realm*, this month. Messrs. Morton & Co. have three vessels in their yard, and have also launched a fine steamer, named the *Norna*, this month. Messrs. Hawthorns have two small steamers rapidly approaching completion; thus making a total of 12 vessels building in Leith just now. In the docks also a large amount of work is being done; in the Edinburgh Dock the two steamers *Trafalgar* and *Mersario*, are being engined by Messrs. Alley & Maclellan and Hawthorns respectively, while in the Albert Dock the new steamers *Realm* and *Norna* are being fitted out; the large telegraph ship *Norseman* has also been undergoing extensive repairs.

inst. the magnificent new steel screw steam yacht

*Semiramis* went her official trial trip with a large party of ladies and gentlemen on board, after which she sailed for Bergen and Norway on an extensive cruise.

The General Steam Navigation Co.'s new steamship *Seamer* in the beginning of the month beat the record from the Forth to London, making the passage from Granton Harbour to Iron-gate Wharf, London, in 26 hours 40 minutes.

Arrangements have been made for regular steam communication between Leith and Sunderland. The sailings take place from Leith on Mondays and Fridays, and from Sunderland on Wednesdays and Saturdays. It is generally expected here that there will be a rise in freights this fall, which ought to give an impetus to shipbuilding. There are several orders going the round of Leith just now but nothing has been definitely fixed yet.

## Miscellaneous.

ACCORDING to a Berlin telegram the direct line of steamers which it is proposed to run regularly between Hamburg and Morocco is a purely private enterprise, and not a scheme under the auspices of the German Government, nor likely to receive an Imperial subsidy.

ARGENTINE NAVAL ARMAMENTS.—The Argentine Government have placed an order with Messrs. Yarrow & Co., of Poplar, for six first-class torpedo boats, 180 ft. long, to have a speed of 23 knots, and eight second-class craft 60 ft. long, to steam 17 knots. These vessels are to be similar to those now in course of construction by the above-named firm for the British Admiralty.

NAVAL CONTRACTS.—The Admiralty authorities have entered into contracts with several private shipbuilding firms for the construction of nine second-class cruisers, provided for under the Naval Defence Act. Three of these vessels are to be built at Palmer's Shipbuilding Works, Jarrow, while the remainder are distributed to the Armstrong Co., Elswick; the Naval Construction and Armaments Co., Barrow-in-Furness; the Glasgow Engineering Co., Port Glasgow; and the Fairfield Works, Govan.

A TESTIMONIAL, consisting of an illuminated address and a purse of £150 has been presented by over 100 subscribers to Captain Henry W. Hemmings, "on his retirement from the Newhaven and Dieppe Continental route, in recognition of his unvarying kindness and courtesy in the discharge of his duties as captain of the various vessels under his command, heartily wishing him every success in his new sphere of duty as deputy-marine superintendent of the Great Western Railway Co.'s fleet of steamers sailing from Weymouth."

FASTEST ON RECORD.—Messrs. Donald Currie & Co.'s Castle packet *Roslin Castle* (Captain Webster) arrived at Plymouth at 3.50 on Sunday morning, July 21st, with mails and passengers from Cape Colony and Natal. This steamer's voyage from Cape Town, via St. Helena, Ascension, and Madeira, is the shortest recorded passage by this route, the run having been accomplished in 17 days 10 hours 80 minutes, including stoppages at the three islands. The nett steaming time was 17 days 1 minute.

MESSRS. J. & G. THOMSON, Clydebank, are credited with having secured for three of the cruisers, and the London and Glasgow Shipbuilding Co. with the other three. These are all to be vessels of 3,400 tons, and as regards protection, engine-power, speed, and coal-supply, are practically reproductions of the *Medea* class, two of which—the *Magicienne* and *Marathon*—were built by the Fairfield Co. last year. They are, however, to be more heavily armed than the *Medea*, 35 ft. longer, and of about 600 tons greater displacement. The Fairfield Shipbuilding and Engineering Co. are also said to have been entrusted with the construction of two sets of twin-screw triple-expansion engines, each of 12,000 I.H.P., for two first-class cruisers building in Government yards.

At the Board of Trade Examination for extra 1st Class Engineers, held at North Shields on July 9th, 10th, and 11th, the following gentlemen succeeded in satisfying the Examiner, viz.: Mr. F. Hardy, of Alnwick, and Mr. R. Parry-Jones, of Caernarvon, both of whom were prepared by Mr. W. H. Thorn, 5, Waterloo Terrace, North Shields. It may be mentioned that only three candidates passed throughout the kingdom.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES.—ENGLISH.

**Falmouth Castle.**—On June 19th there was launched from the shipbuilding yard of Mr. W. H. Lean, at Falmouth, a handsomely-modelled steamer. She was built for the Roseland Falmouth Steam Packet Co. She was named the *Falmouth Castle* by Miss Nelly Kendall, of St. Mawes, and is intended for the passenger service between Falmouth and St. Mawes. Her dimensions are:—60 ft. long; 13 ft. 4 in. beam; and 7 ft. deep; and she is fitted with a pair of compound surface-condensing engines, 9½ and 17 in. cylinders, 12-in. stroke, and a steel boiler, working pressure 90 lbs.

**Elise Marie.**—On June 20th there was launched from the Low Walker shipbuilding yard of Messrs. Sir G. W. Armstrong & Co., a large tank steamer, capable of carrying 4,500 tons deadweight on a moderate draught of water. She was named the *Elise Marie* by the wife of Captain Hirsch, who will command the vessel. The vessel has been built to the order of the Tank Steamship Co., of Hamburg, and is constructed to the highest class Veritas, and will be fitted throughout in the most complete manner in accordance with the well-known system of the builders, who have made this class of vessels a speciality. After the launch the steamer proceeded to the works of the Wallsend Slipway and Engineering Co., where she will be fitted with triple-expansion engines, embracing all the latest improvements, assisted draught, etc.

**Albert.**—On June 21st there was launched from the yard of Mr. J. H. Fellows, at Yarmouth, another hospital ship, to be employed in the North Sea among our deep-sea fishermen. The vessel, which was named the *Albert*, is of the same dimensions as the *Queen Victoria*, which was launched last September, except that she is 3 ft. longer. She is about 100 ft. long, 25 ft. in width, 12 ft. 6 in. in depth, and between 150 and 160 tons register. She is well built, and admirably fitted for the work for which she is intended. The central portion of the vessel will be made the hospital, the after-part being taken up for cabins for the doctor and skipper. The crew will be berthed forward of the hospital.

**Leconfield.**—On June 25th Messrs. Schlesinger, Davis & Co. launched from their shipbuilding yard, Wallsend-on-Tyne, a large steel screw steamer named the *Leconfield*, built to the order of Messrs. G. R. Sanderson & Co., of Hull. The vessel is of the following dimensions:—Length, between perpendiculars, 235 ft.; breadth, moulded, 39 ft.; depth, moulded, 21 ft. 5 in.; and is designed to carry a deadweight of 3,300 tons. She is constructed on the cellular bottom principle, in the holds, for water ballast, and has a long raised quarter-deck, long bridge, extending beyond foremast, and a topgallant forecastle. Shifting boards will be fitted to each hold in order to comply with the Grain Cargoes Act. She will be rigged as a two-masted top-sail schooner. Messrs. Bow, McLachlan & Co.'s steering gear will be fitted in the wheel-house amidships, and Messrs. Emerson, Walker & Thompson Bros. windlass on the forecastle. The vessel will also be fitted with four powerful steam winches for the rapid loading and discharging of cargo. The accommodation for the captain is under the raised quarter-deck aft, and that for engineers and officers in houses on the quarter-deck amidships, the forecastle being fitted up in a substantial manner for the crew. The *Leconfield*, classed 100 A 1 in steel at Lloyd's, has been built under special survey. The engines, of the triple-expansion description, are 170 N.H.P., having cylinders 21 in., 33 in., and 54 in. diameter, and 42 in. length of stroke. The boilers are of steel, two in number, working at a pressure of 160 lbs. per square inch. The machinery has been constructed by Messrs. Black, Hawthorn & Co., Gateshead, and, together with the hull, has been erected under the superintendence of Mr. Robert Carson, of Hull, the owners' superintendent engineer. The vessel was named by Mrs. Fraser, of Hesse, a sister of one of the owners.

**Daylight.**—On June 25th Messrs. Raylton, Dixon, & Co., Middlesbrough, launched a fine steel screw steamer named the *Daylight*, which has been built for Messrs. John Wood & Co., West Hartlepool. This vessel is built with raised quarter-deck, topgallant forecastle, and long bridge, her leading dimensions being:—Length over all, 305 ft. 3 in.; breadth, extreme, 38 ft.; depth, moulded, 22 ft. 10 in.; 3,650 tons deadweight capacity. Her engines, which will be fitted by Messrs. T. Richardson & Sons, Hartlepool, are on their triple-expansion principle, with cylinders 22 in., 35 in., and 59 in., and 39 in. stroke.

**Planet.**—On June 25th the torpedo-boat catcher *Planet*, which has been built to the order of the Austro-Hungarian Government by Palmer's Shipbuilding and Iron Co., Limited, was launched from the builders' yard at Jarrow. She is a steel twin-screw torpedo gunboat, or torpedo-boat destroyer, and is of the following dimensions:—Length over all, 220 ft.; length, between perpendiculars, 210 ft.; breadth, moulded, 28 ft.; depth, moulded, 13 ft. The mean draught of water in sea-going trim is 8'4, and the displacement at this draught is 480 tons. The engines are capable of developing with forced draught an I.H.P. of 3,500, which will propel the vessel at a mean speed of 20½ knots. The armament consists of two 80 mm. quick-firing guns, one placed at each end of the vessel; eight similar guns of 47 mm. calibre, placed along the side; and three torpedo tubes, one placed in the bow and the other two amidships, both on one carriage, and capable of launching torpedoes on either side of the vessel. The hull is built entirely of steel manufactured by the Palmer Co., and the vessel is lighted internally throughout by electricity, about 70 lamps being required for this purpose. The vessel was christened by the Countess Deym, wife of the Austro-Hungarian Ambassador.

**Ebro.**—On Friday, June 28th, Messrs. Richardson, Duck & Co. launched from their building yard at South Stockton, a steel screw steamer of the following dimensions, viz.:—Length over all, 307 ft. 4 in.; breadth, extreme, 40 ft.; depth in hold to tank top, 19 ft. This vessel has been built for Messrs. Thomas Wilson, Sons & Co., Hull, under the personal superintendence of Mr. J. F. Wilkins, the owners' surveyor. She has a raised quarter-deck and a long bridge joined to the forecastle; also a double bottom on the cellular principle, extending fore and aft for water ballast, etc., etc. Her engines, by Messrs. T. Richardson & Sons, of Hartlepool, are of triple-expansion type, with cylinders 22½ in., 37 in., and 61 in., by 39 in. stroke. She is fitted with direct acting windlass, Emerson, Walker & Co.'s patent. As she was leaving the ways the vessel was christened the *Ebro* by Miss Wilkins, daughter of Mr. J. F. Wilkins, of Hull.

**Garlands.**—On Friday, June 28th, Messrs. W. Gray & Co., Limited, launched the tenth steamer they have built for Messrs. Hardy, Wilson & Co., of West Hartlepool. The new vessel is built of Siemens-Martin mild steel, and is of the following dimensions, viz.:—Length over all, 260 ft.; breadth, 36 ft. 6 in., and depth, 21 ft. 6½ in., and over 3,000 tons deadweight capacity. She will take Lloyd's highest class, and is built on the web-frame and intercostal stringer system, dispensing with hold beams, and giving a clear hold for stowing bulky goods. The deck erections consist of a poop, with a handsome saloon and cabins; a raised quarter-deck, long bridge to fore-hatch, and topgallant forecastle, with accommodation for crew. The outfit and equipment consist of all modern appliances for a first-class cargo steamer of her size, including patent windlass, Emerson, Walker & Co.'s patent, four steam winches, hand and steam steering gear amidships, screw steering gear aft, large donkey boiler, large hatchways, boats on beams overhead, pole masts with smart schooner rig, double bottom under each hold for water ballast, etc. Triple-expansion engines, working on three cranks, to develop 800 H.P., and two steel boilers to supply steam, at a working pressure of 154 lbs. per square inch, are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. She was gracefully christened *Garlands* by Mrs. Tassell, Seaton Carew. The hull and machinery have been superintended during construction by Mr. J. Maddison, on behalf of the owners.

**Aquila.**—On June 29th Messrs. Wigham, Richardson & Co. launched from their Neptune Works at Newcastle-on-Tyne a large twin-screw steamer, which they are building to the order of Messrs. Fratelli Lavarello fu Gio, Batta, of Genoa, as an addition to their fleet of emigrant steamers which have obtained such splendid reputations for their quick passages from Italy to the River Plate. The vessel, which is 340 ft. b.p. by 39 by 27 ft., moulded, was named the *Aquila* by Mrs. John Tweedy, and immediately after the launch was placed under the shears to receive her machinery, which is also being constructed by the builders.

**Aberfeldy.**—On June 29th there was launched from the building yard of Messrs. John Readhead & Sons, South Shields, a steel screw steamer, built to the order of Messrs. McLean, Doughty, & Co., of West Hartlepool. The following are the dimensions:—Length, 290 ft.; breadth, 39 ft.; depth, 21 ft 8 in. She is of the improved well-deck type, with poop, lon

raised quarter-deck, bridge amidships, and topgallant forecastle, filled with water ballast in cellular bottom, and all the requirements for compliance with the Grain Cargoes Act. The engines, by Messrs. Readhead & Sons, are of the triple-expansion principle, with cylinders of 22 in., 36 in., and 50 in., and a piston-stroke of 39 in. Steam will be supplied by two large boilers, working at a pressure of 160 lbs. to the square inch. The vessel has been built under special survey to class 100 A 1 at Lloyd's, and will have a deadweight carrying capacity of 3,450 tons. She was named the *Aberfeldy* by Miss Doughty, of West Hartlepool.

**Empress.**—On June 29th Messrs. W. Gray & Co., Limited, launched a handsomely-modelled screw steamer, built to the order of C. M. Webster, Esq., Pallion Hall, Sunderland, for the passenger service of the West Hartlepool Steam Navigation Co., between West Hartlepool and Hamburg. The dimensions of the vessel are:—Length over all, 270 ft.; breadth, 31 ft. 6 in.; depth, 16 ft. She takes Lloyd's highest class, is built of Siemens-Martin mild steel, and is of the partial awning deck type, with openings between the poop, bridge, and forecastle for the convenient working of three of the hatchways. The main deck is of steel, sheathed with wood. The hull is framed with webs and intercostal stringers, and lower 'tween decks are laid forward, for the accommodation of emigrants and light goods. The poop contains a long dining saloon, which will be beautifully framed with hardwood and french polished, also first-class state-rooms along each side, ladies' cabins, etc. A deck house is fitted up for cabin entrance and smoking-room. A large portion of the fore part of the ship will be fitted up for the accommodation of emigrants, and she will be fitted throughout with electric lighting. All the usual first-class working appliances are provided, including patent stockless anchors, stowing into hawse pipes, patent windlass, four steam winches, donkey boiler, five hatchways, hand and steam steering gear amidships and screw gear aft, boats on beams overhead, pole masts with fore-and-aft rig, and double bottoms under main and after holds for water ballast. The engines are of the triple-expansion type, working on three cranks, and will develop 1,500 H.P. Ample steam will be supplied, at a working pressure of 160 lbs. per square inch, by two large double-ended steel boilers. The machinery is made by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. With these powerful engines and her fine lines the ship will steam 14 knots per hour at sea, and should prove a favourite with passengers on her route. The christening ceremony was gracefully performed by Miss Mary Maling Webster, daughter of Ernest A. Webster, Esq., of Wolviston Hall, the ship being named *Empress*. During construction the hull and machinery have been under the superintendence of Captain Geo. Wright, Mr. Chas. E. Webster, and Mr. Newton, on behalf of the owners. The *Empress* is the ninth vessel Messrs. W. Gray & Co., Limited, have built for the same owners.

**Hibernia.**—On Monday afternoon, July 1st, Messrs. Raylton, Dixon & Co., Middlesbro', launched a fine steel screw steamer from their Cleveland dockyard, which has been built to the order of the International Line Steamship Co., Limited, of Whitby. The leading dimensions of this vessel are:—Length, 305 ft. 3 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in., with a deadweight capacity of 3,650 tons. She is built on the partial awning deck system, and fitted in every way as a first-class cargo steamer. Her engines, which are being built by Messrs. T. Richardson & Sons, Hartlepool, are of 210 nominal H.P., with cylinders 28 in., 37 and 61 in., by 42 in. stroke. She is fitted with direct acting windlass, Emerson, Walker & Co.'s patent. On leaving the ways she was gracefully christened *Hibernia* by Mrs. F. W. Bentley, wife of one of the directors.

**Yesta.**—On July 1st there was successfully launched from the shipbuilding yard of Messrs. S. P. Austin & Son, Sunderland, a handsomely-modelled steel sailing barge of the following dimensions:—Length, between perpendiculars, 233 ft.; breadth, 37 ft.; depth, 22 ft.; tonnage, about 1,400 net. The vessel is constructed with a half poop; large iron house on deck for crew, containing comfortable berths, galley, and hospital; anchor forecastle; iron masts, bowsprit, and lower topsail and topgallant yards. She is to be classed 100 A 1 at Lloyd's, and has been built to the order of a Hamburg firm, under the superintendence of Captain Klock, who will command is constructed as a sister ship to the *Pallas*, built last year by Messrs. Austin for the same firm. As the vessel left the ways she was named *Yesta* by Mrs. Klock.

**Alphonse Parran.**—On July 2nd this vessel was successfully launched from the yard of Messrs. W. Duxford & Sons, at Pallion. She has been built to the order of the Anglo-Algerian Steamship Co., managed by Messrs. F. C. Strick & Co., of London, is entirely of steel, and built to Lloyd's 100 A 1 class. The principal dimensions are:—Length, between perpendiculars, 270 ft.; breadth, extreme, 37 ft.; depth, moulded, 19 ft. 8 in., with cellular bottom fore and aft. The engines are triple-expansion three-cranks, by Messrs. Duxford, with all the latest improvements, the cylinders being 21 in., 33 in. and 54 in. by 36 in. stroke, and supplied with high steam, 160 lbs., from large boilers. She is fitted with Bow, McLachlan's patent steam steering gear, and Woodward & Watson's screw gear aft. She has also two 7 in. by 10 in. and two 7 in. by 12 in. steam winches, by Messrs. Welford Bros., of Pallion, with the latest improvements for cargo purposes. The cabins are beautifully got up in hardwood in the poop aft, and give most comfortable quarters for the captain and officers, the engineers being berthed in the bridge-house abaft the engine-room, and the crew and firemen in front of bridge-house. The christening ceremony was gracefully performed by Miss Haswell, of Monkseaton.

**Blarney.**—On July 3rd there was launched from the yard of Earle's Shipbuilding & Engineering Co., Limited, at Hull, the s.s. *Blarney*, built to the order of the City of Cork Steam-Packet Co., Limited, for their Irish Channel passenger and cattle trade and for general cargo purposes, the dimensions being 256 ft. 6 in. by 33 ft., by 18 ft. 7½ in., with the greater portion of the upper deck covered by poop bridge and forecastle. Accommodation for first-class passengers and officers is provided under the poop, and comprises saloon, smoke room, ladies' room, and every convenience. The saloon is carried out in polished woods, and the entrance to this and the smoke room will be decorated with marble and ornamental tiles. The forecastle is fitted for accommodation of crew, deck passengers, barrack room, etc. The remaining portion of upper deck as well as 'tween deck and holds, are arranged for the carriage of cattle and horses. Powerful cranes are provided for working cargo; steam steering gear is fitted for the midship gear and screw gear aft. The ship has straight stem, elliptic stern, is schooner-rigged, and has good lines for speed. The machinery consists of a set of triple-compound inverted engines, having cylinders 24 in., 38 in. and 62 in., by 42 in. stroke, and large steel boilers, made for a working pressure of 160 lbs. per square inch.

**Mittelweg.**—On July 5th Messrs. Short Bros. launched from their yard at Pallion a handsomely-modelled screw steamer for Messrs. J. H. Lorentzen & Co., Hamburg. The following are the principal dimensions:—Length, 240 ft.; breadth, 33 ft.; and depth, moulded, 16 ft. 11½ inches. The vessel is built to the highest class in Lloyd's Registry, with double bottom throughout. The hold is divided by six water-tight bulkheads, and there is a very large hatchway, with powerful steam winch to each hold, and she is fitted throughout with electric light by Messrs. Clarke, Chapman & Co., which will facilitate discharging of cargo. The vessel has Donkin & Nichols' steam steering gear amidships, and screw gear aft, donkey boiler of 160 lbs. pressure by Riley Brothers, and Emerson, Walker, Thompson Brothers' windlass. The officers are accommodated in short poop aft, the engineers across after end of bridge-house amidships, and the crew are berthed in forecastle. The engines, which are to be fitted by Mr. John Dickinson, are triple-expansion, of 20 in., 33 in., and 54 in. cylinders, with 39 in. stroke, to propel the vessel when loaded at a speed of 12 knots per hour. The vessel is specially designed to do the trip to Hamburg in three tides. On leaving the ways she was named *Mittelweg* by Miss Short, of Brookside.

**Junco.**—On Wednesday, July 10th, there was launched from the yard of the Earle's Shipbuilding and Engineering Co., Limited, Hull, the screw-steamer *Junco*, which they have constructed to the order of Messrs. Thos. Wilson, Sons & Co., of the same port, for the Norwegian passenger trade. The dimensions are:—215 ft., by 30 ft. by 22 ft. 6 in. depth of hold, and the vessel is built of steel, of the awning deck type, having a flush deck all fore and aft; cellular double bottom for water ballast, and collision bulkhead of curved form for giving additional strength. The first-class passenger accommodation is amidships, and will comprise spacious dining saloon, smoking room, ladies' room, and all necessary conveniences, while the main saloons will be fitted in polished woods with carved work, and marble panelling. The arrangements are such as will enable the accommodation to be readily extended for a large additional number of passengers in case of need, and a com-

fortable cabin is fitted aft for second-class passengers. The captain and officers are berthed amidships, the crew's quarters being forward, and the 'tween decks made available for emigrants. Steam steering gear is fitted amidships, and a powerful screw hand gear aft, and the vessel will be schooner-rigged with pole masts. Her machinery comprises a set of triple-compound engines, with cylinders  $20\frac{1}{2}$  in.,  $31\frac{1}{2}$  in., and 54 in. diameter, by 33 in. stroke, and two large steel boilers, fitted with Henderson's self-cleaning grate bars, and made for a working pressure of 160 lbs. per square inch.

**Nairnshire.**—On July 11th Messrs. R. & W. Hawthorn, Leslie & Co., Limited, of Hebburn, launched for Messrs. Turnbull, Martin & Co., of Glasgow, a large screw steamer built for the Australian and New Zealand trade. The length of the vessel is 360 ft. and breadth 43 ft., with a deadweight capacity of 5,500 tons. She has been specially built for the carriage of dead meat from the colonies to England, and her holds are fitted with exclusive refrigerating chambers and refrigerating engines of the most improved pattern. She has accommodation for about 50 first-class passengers in a fine saloon aft, the state-rooms being large and well ventilated. She is fitted throughout with electric light and machinery of the most improved type for the rapid loading and discharge of cargo. The engines are triple-expansion, also by Messrs. Hawthorn, Leslie & Co., and are of about 2,500 H.P. The vessel has been built under the superintendence of Mr. John Wotherspoon, and is classed 100 A 1 at Lloyd's. She will also be placed on the Admiralty list as a transport in time of war. On leaving the ways she was named the *Nairnshire* by Mrs. Wallace.

**An enormous Caisson.**—On Saturday morning, July 13th, a large concourse of people assembled on the banks of the Wye to witness the launch of one of the enormous Caissons built by Messrs. Edward Finch & Co., Limited, to the order of the Barry Graving Dock Co., Limited. This Caisson will close the Graving Dock, which is the largest in existence, and when the second or intermediate Caisson (to be launched from the same yard in a few days) is in place, will be able to take in four large ships at one time; all the arrangements having been completed the Caisson, weighing about 350 tons, gracefully glided into the water in the presence of several of the directors of E. Finch & Co., and of the Barry Graving Dock Co., and was at once taken in tow of four tugs for Barry, Mr. James Ware, the Chairman of the Graving Dock Co., and Mr. John Lowdon, their manager, accompanying her on the voyage. Also on Monday, the 15th inst., there were launched, from the same yard, five more of the 150-ton Steel Coaling Lighters, built to the order of the Lords Commissioners of the Admiralty.

**Ceres.**—On Saturday, July 13th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, at Willington Quay, a steel screw steamer of the following dimensions:—Length, between perpendiculars, 210 ft.; breadth, 31 ft.; depth, 16 ft. This vessel has been built to the order of Messrs. Fisher, Renwick & Co., of Newcastle-on-Tyne, for Mr. Kroguis, of Helsingfors, Finland, and will be fitted with triple-expansion engines, having cylinders 17 in., 28 in., and 46 in. by 30 in. stroke, and 150 lbs. working pressure, and with large donkey boiler, four powerful steam winches, steam and hand steering gear amidships, right and left-handed screw-steering gear aft, and all facilities for rapidly loading and unloading of cargo. On leaving the ways the vessel was gracefully named the *Ceres* by Miss Bessie Lewis, of Cardiff.

**Ermanarich.**—On Saturday, July 13th, Messrs. W. Gray & Co., Limited, launched the screw steamer *Ermanarich*, sister ship to the *Theodorich*, *Alarich*, and *Geiseric*, which they launched recently for the same owner, Herr Johannes Lange, of Kiel, Germany. The steamer is built of Siemens-Martin mild steel, and of the following dimensions, viz:—Length over all, 255 ft.; breadth, 35 ft.; and depth, 21 ft. 11 in. She will take Lloyd's highest class, and is of the awning-decked type, with saloon and cabins for captain, officers, etc., aft, crew's berths forward, and engineers' accommodation in deck-houses amidships. The hull is built on the web-frame principle, large hatchways are fitted, four steam winches, hand and steam steering gear amidships, and screw gear aft, Emerson, Walker & Co.'s direct steam windlass, donkey boiler and cellular double bottom for water ballast. Pole masts with fore-and-aft rig, boats on beams overhead, and everything complete will be provided for general trading. Fine triple-expansion engines, and two steel boilers are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. Messrs.

Menzie & Co., Newcastle-on-Tyne, have superintended the ship and machinery on behalf of the owners. She was gracefully christened by Miss Sefton, of Culchaph, near Warrington.

**Ile of Jura.**—On July 13th Messrs. Thomas & William Smith, Milburn Place, North Shields, launched from their shipbuilding yard a finely-modelled steel screw steamer, built to the order of Messrs. Dixon, Robson & Co., Newcastle. The vessel is 215 ft. long, 30 ft. 6 in. broad, and her depth of hold is 15 ft., with a carrying capacity of 1,300 tons deadweight. The engines will be supplied by the North-Eastern Marine Engineering Co., Limited, Wallsend, and her boilers will be of 160 lbs. pressure. She will be fitted with all the latest improved facilities for quick loading and discharging of cargo, and will be classed 100 A 1 at Lloyd's for hull and machinery. As the vessel left the ways she was named the *Ile of Jura* by Mrs. Dykes, wife of the marine superintendent to the owners, under whose inspection the vessel has been constructed. The *Ile of Jura* is the fifth vessel built by Messrs. T. & W. Smith for Messrs. Dixon, Robson & Co.

**Garnet.**—On July 13th Messrs. J. Blumer & Co. launched from their shipbuilding yard a screw steamer of the following dimensions:—Length, between perpendiculars, 250 ft.; breadth, 35 ft.; depth, 16 ft. 9 in. to tank. The vessel is built on the cellular bottom and web-frame system to class 100 A Lloyd's. The deck erections consist of topgallant fore-castle for crew, bridge over engines and boiler space, with accommodation for officers at fore-end, and long raised quarter-deck with hood aft. The deck machinery includes four steam winches by Messrs. Rodger & Co., Stockton; patent steam windlass by Clark, Chapman & Co.; patent steam-steering gear by Alley & Maclellan; and steering gear aft by Messrs. John Hastie & Co., Greenock, together with all the latest improvements for quick discharge of cargo. The engines will be fitted by Messrs. Hutson & Corbett, Glasgow, having cylinders 18 in., 30 in., and 48 in. diameter, with a stroke of 36 in.; steam will be supplied by two steel boilers working at a pressure of 160 lbs. The steamer, built to the order of Messrs. W. Christie & Co., London and Glasgow, was, on leaving the ways, named *Garnet* by Miss Bertha Lambert, of Sunderland.

**Gloucester City.**—On July 13th there was launched from the shipbuilding yard of Messrs. Joseph L. Thompson & Sons, North Sands, a steel screw steamer of 3,450 tons deadweight carrying capacity. This vessel has been built to the order of Messrs. Charles Hill & Sons, of Bristol, is of the raised quarter-deck type and web-frame system of construction, and has been built under special survey to class 100 A at Lloyd's. The cargo holds are subdivided by six steel watertight bulkheads, and the vessel is fitted with water ballast fore and aft on the cellular double-bottom principle. The engines are of the triple-expansion type, having three cranks, and have been constructed by Messrs. Blair & Co., Limited, of Stockton. Two steel boilers of multitubular form will be fitted, having a working pressure of 160 lbs. to the square inch. The deck machinery consists of four of Lynn's horizontal steam winches, direct steam windlass, and Lynn's latest improved horizontal steam steering gear amidships, with screw gear aft. The deck machinery is supplied with steam with donkey boiler, which is placed in the stokehole. The vessel has been during construction under the supervision of Captain Jones, who will command the vessel. The ceremony of naming her the *Gloucester City* was performed by Mrs. Jones, of Bristol, wife of the commander.

**Tynedale.**—On July 13th Messrs. Ropner & Son launched at Stockton a steel screw steamer of the following dimensions:—Length overall, 282 ft. 6 in.; breadth, 38 ft. 10 in.; depth, moulded, 21 ft. 11 in. This steamer has been built under special survey to class 100 A 1 at Lloyd's, and will carry 3,300 tons deadweight on Lloyd's summer freeboard. She has a short, full poop in which is fitted accommodation for captain and officers, raised quarter-deck, long bridge extending to foremast, short well and topgallant fore-castle, and cellular bottom for water ballast. She is built on the web-frame principle, and will have all the latest improvements for a first-class cargo steamer, including patent steam windlass, Emerson, Walker & Co.'s patent. Her engines are by Messrs. Blair & Co., Limited, on their improved triple-expansion principle, of 1,000 I.H.P., with two large steel boilers working at 160 lbs. The steamer has been built to the order of the Newcastle house of Mr. Christopher Furness, of West Hartlepool and Newcastle, and, as she left the ways, was named *Tynedale* by Mrs. R. B. Stoker, the wife of the manager of the Newcastle house.

**Meggie.**—On Monday afternoon, July 15th, Messrs. Richardson, Duck & Co., launched from their yard an iron screw steamer, of the following dimensions:—Length over all, 280 ft.; breadth, 36 ft. 6 in.; depth, moulded, 19 ft. 1½ in. This vessel, which has been built to the order of Messrs. Burdick & Cook, of London, is classed 100 A 1 at Lloyd's, and has been built under special survey. She has a short break poop, raised quarter-deck, long bridge from after end of engine-room to foremast, and a topgallant forecastle. Has a cellular double-bottom fore and aft for water ballast, and will be schooner-rigged. Her engines by Messrs. Blair & Co., Limited, have cylinders 21½ in., 35 in., and 57 in. by 36 in. stroke. As the vessel was leaving the ways she was gracefully christened *Meggie* by Mrs. Burdick, wife of one of the managing owners. Amongst the friends assembled at the launch were Mr. and Mrs. Cook, Mr. Burdick, Mr. Eugene Cocquerel, and Capt. S. Shotton, who will take command of her.

**Mary Thomas.**—On July 15th there was launched from the building yard of Palmer's Shipbuilding and Iron Co., Limited, at Howdon, a finely-moulded cargo boat of the following dimensions, viz.:—Length between perpendiculars, 275 ft.; breadth, 37 ft. 6 in.; and depth, moulded, 21 ft. 8 in. The vessel will be rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. She is of the well-decked type, with the bridge extending to the foremast. The upper decks are of iron. The captain and officers' accommodation is provided in a sunk poop aft; the engineers' accommodation is at the aft end of the bridge, and the crew at fore end. Water ballast is fitted in a double bottom throughout the holds. Emerson, Walker & Thompson Brothers' direct steam windlass is fitted forward, Muir & Caldwell's steam steering gear amidships, and Hastie's screw gear aft. The vessel will load about 3,100 tons deadweight on a moderate draught. On leaving the ways the vessel was named the *Mary Thomas* by Miss Annie Thomas, daughter of the owner.

**Elena Cosulich.**—On July 15th there was launched from the shipbuilding yard of Messrs. John Priestman & Co., Southwick, a handsomely-modelled steel screw steamer of the following dimensions:—Length, 240 ft.; extreme breadth, 32 ft.; depth, moulded, 16 ft. 4 in. The vessel has raised quarter-deck, long bridge to foremast, and topgallant forecastle. She has been built to the order of Signor Callisto Cosulich, Lussinpiccolo, is to have highest class at Lloyd's, namely, 100 A, and is designed to carry 1,650 tons of cargo. Water ballast tanks are fitted in the fore and after holds, capable of containing about 270 tons. The main and quarter decks are of iron. The cabin for captain and officers is fitted under bridge amidships, and for engineers at after-end of bridge. She is schooner-rigged, and is fitted with four large steam winches, made by Mr. John Wigham, of Hylton, and windlass by Messrs. Harfield & Co., London. The engines, which are supplied by Messrs. Hutson & Corbett, Kelvinhaugh Works, Glasgow, are of about 700 indicated H.P. The working pressure of the boiler is 160 lbs. The ship was named *Elena Cosulich* by Mrs. Huntly, Sunderland.

**Earnsdale.**—On July 15th there was launched from the Jarrow yard of Palmer's Co. a screw steamer of the following dimensions:—Length, between perpendiculars, 290 ft.; breadth, 39 ft.; depth, moulded, 25 ft. 3 in. The vessel is rigged as a two-masted schooner, with square sails on the foremast, and is built to class 100 A 1 at Lloyd's, three-decked type. The upper and main decks are of steel throughout. A full poop is fitted aft; long bridge amidships, covering machinery openings and containing accommodation for captain, officers, and engineers, and a topgallant forecastle for crew and firemen. Water ballast is fitted all fore and aft on the cellular bottom system, and the vessel is divided into six compartments by watertight bulkheads. A complete set of shifting-boards and grain feeders are fitted for grain cargoes. Harfield's direct steam windlass is fitted on the forecastle deck, Davis's steam steering gear amidships, and Hastie's screw gear aft. The vessel will load about 3,500 tons deadweight on a moderate draught. The steamer, hull and engines, has been built for the Earn Line Steamship Co., Philadelphia, under the supervision of Mr. Boyt, inspector for the owners. On leaving the ways she was named the *Earnsdale* by Miss Richardson.

**Wyndcliffe.**—On July 16th there was launched from the yard of Messrs. Craig, Taylor & Co. the s.s. *Wyndcliffe*, which vessel has been built to the order of Messrs. Douglas H. Morgan & Co., of Newport, Mon. Her dimensions are:—Length, 278 ft.; breadth, 37 ft.; depth, 19 ft. 8 in. She has double bottom for water ballast in holds and in peaks for

about 500 tons. She will be fitted with four steam winches and steam steering gear by Messrs. R. Rogers & Co., of Stockton; patent windlass by Messrs. Emerson, Walker & Thompson Bros.; lighthouses; Messrs. Hastie's screw gear aft, and all modern improvements, so as to admit of rapid loading and discharging. The engines, on the triple-expansion three-crank system, are being constructed by Mr. Middleton Pratt, of Huddersfield, and are of the following sizes:—Cylinders, 20 in., 33 in., and 54 in. by 36 in. stroke; two large steel boilers, 160 lbs. pressure. Miss Taylor, of Oakwell, Birstall, performed the christening ceremony.

**Activ.**—On Tuesday afternoon, July 16th, there was launched from the yard of Messrs. Wood, Skinner & Co., Bill Quay, a steel screw steamer, built to the order of Mr. Otto Thoreson, of Tonsberg. The principal dimensions are:—Length, 259 ft.; breadth, 35 ft.; depth, moulded, 18 ft.; with a deadweight carrying capacity of 2,000 tons. She is constructed on the web-frame and cellular-bottom principle, and will be registered in the highest class at Lloyd's, and also Norwegian Veritas. The engines have been built to Lloyd's and Norwegian Veritas requirements by the North-Eastern Marine Engineering Co., Limited, Wallsend. They are on the triple-expansion system, of 750 I.H.P., and are capable of propelling the vessel at a speed of 10 knots an hour loaded. The vessel, which was named the *Activ*, is of the well-deck type, with the cabins in the bridge-house amidships. The upper decks are of iron. Water ballast is fitted in the cellular double-bottom throughout the holds. Harfield's patent windlass is fitted forward, Bow McLachlan's steam steering gear amidships, and Hastie's screw gear aft. The christening ceremony was gracefully performed by Mrs. Röd, the bride of Captain Röd, who is to be the future commander of the ship, as the vessel left the ways. This is the third vessel launched by Messrs. Wood, Skinner & Co. for Norwegian account this year, and they have still others in hand.

**Tronto.**—On July 16th Messrs. Thomas Royden & Sons launched from their shipbuilding yard, Queen's Dock, Liverpool, a steel screw steamer of the following dimensions:—277 ft. by 37 ft. 6 in. by 20 ft., to carry 3,150 tons deadweight; built to the highest class at Lloyd's, to the order of E. C. Thin, Esq., of Liverpool. As she left the ways the vessel was named the *Tronto* by Miss Isabel Thin, eldest daughter of the owner. The vessel was afterwards towed to the Sandon Dock, where she will be fitted with engines and boilers by Messrs. George Forrester & Co., Limited, Vauxhall Engine Works.

**Dalmally.**—On Wednesday, July 17th, Messrs. Edward Withy & Co. launched from their yard at Hartlepool, a large steel screw steamer, built to the order of Messrs. George Horsley & Sons, West Hartlepool. She is a large vessel measuring over 300 ft. in length, constructed throughout of Siemens-Martin steel, and built to the highest class at Lloyd's. She has a long raised quarter-deck, long bridge-house, and topgallant forecastle. The holds are fitted with iron grain divisions and iron cargo battens; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after-holds the vessel is built on the web-frame system, which gives a very strong type of ship, and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted fore and aft for water ballast; the after-peak is also available for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey-boilers, steam-steering gear amidships, screw gear aft, direct steam windlass on forecastle, patent stockless anchors, hauling up into hawse pipes, and all other modern appliances are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the passengers, captain and officers, is handsomely-fitted in polished hardwood, with neatly-painted panels, executed in very effective style by the decorative staff of ladies employed by the firm. The vessel will be rigged as a two-masted fore-and-aft schooner, with steel pole masts, and all cargo appliances for expeditious handling of cargo. The engines have been constructed by Messrs. T. Richardson & Sons, Hartlepool, and are of the triple-expansion type, with two large single-ended boilers. The hull and machinery have been constructed under the personal supervision of Mr. T. G. Barron. On leaving the ways the vessel was gracefully christened *Dalmally* by Miss Robina Wyllie, daughter of the late Mr. Wyllie, manager for Messrs. T. Richardson.

**Sudero and Sando.**—On Thursday, July 18th, Messrs. Earle's Shipbuilding and Engineering Co., Limited, Hull, launched the two new steam fishing vessels, *Sudero* and *Sando*, which they have built to the order of Mr. Henry Smethurst, Jun., of Grimsby. These boats are intended for line as well as trawl fishing, their dimensions being 105 ft. by 20 ft. 6 in. by 11 ft. 6 in. They are built to Lloyd's highest class, with considerable access of scantling in various respects, and have provision in holds in addition to the fish-well for the storage of fish, ice, etc. The vessels have each one of Earle's special steam winches and connections for trawling purposes, besides which they are fitted with two sets of trawl gear, including fairleads, ports, rollers, revolving bollards, etc. They were towed, after launching, to the Victoria Dock, where they will receive their machinery, which consists of a set of triple-compound, three-crank engines, and a powerful steel boiler made (for a working pressure of 150 lbs. per square inch), by Earle's Co.

#### LAUNCHES.—SCOTCH.

**King Robert.**—On June 26th there was launched from the shipbuilding-yard of Messrs. Wm. Hamilton & Co., at Port Glasgow, a handsomely-modelled three-masted sailing ship, named the *King Robert*. Net register tonnage 1,600 tons, and to carry 2,750 tons. This vessel has been built of steel throughout to the highest class at Lloyd's, and has been fitted with Mille's patent pumps and all the modern improvements for the speedy loading and discharging of cargo. She has been built to the order of Messrs. John A. Walker, of Glasgow, and will be commanded by Captain Rollo. The vessel, after being fitted out, will load a general cargo at Glasgow for San Francisco. During her construction she has been superintended on the owner's behalf by Mr. Hugh Stewart, of Partick. The ceremony of naming the vessel was performed by Mrs. Howatt.

**Valentino Alsinu.**—On June 27th Messrs. Fleming & Ferguson, Paisley, launched a 600-ton twin-screw dredger, built to the order of Mr. T. A. Walker, contractor for the Manchester Ship Canal. The dredger is fitted by the builders with two sets of their patent quadruple-expansion engines, with steel gearing throughout, and all the most recent improvements. This is a duplicate of a dredger recently built by the same firm for Mr. Walker, for Buenos Ayres Harbour Works. She was named *Valentino Alsinu* by Miss Nellie Ferguson, Fergus Villa, Paisley.

**Emerald.**—On June 27th there was launched from the yard of Messrs. John Fullerton & Co., Merksworth, Paisley, an iron screw steamer of 450 tons, built to the order of Mr. William Robertson, 88, Great Clyde Street, Glasgow, for employment in his general carrying trade, and is the ninth steamer built by that firm for Mr. Robertson. She has all the latest improvements for loading and discharging cargo, steam steering gear, and patent windlass. Engines of the tri-compound type of 70 N.H.P. will be fitted by Messrs. Muir & Houston, engineers, Glasgow. The steamer was named *Emerald* by Miss Robertson, daughter of the owner.

**Moray.**—On June 29th the second iron steamship built at Alloa by the Grangemouth & Alloa Dockyard Co. was launched from Kelliebank shipyard. The vessel, as she left the ways, was named the *Moray* by Mrs. Adam, Burghhead, wife of the owner. The vessel is 145 ft. between the perpendiculars; moulded breadth, 24 ft.; moulded depth, 11 ft. 3 in. She is to be supplied with triple-expansion engines by Alley & M'Lelland, Glasgow, and will be schooner-rigged.

**China.**—On June 29th the Fairfield Shipbuilding & Engineering Co., Limited, launched from their yard at Govan the *China*, a steel screw steamer of about 5,200 tons gross, to the order of the Pacific Mail Steamship Co., for their service between San Francisco and China. Her principal dimensions are:—Length over all, 460 ft., and between perpendiculars, 440 ft.; breadth, 45 ft.; and depth, moulded, 36 ft. She will be classed in the highest grade of Bureau Veritas, and is constructed on the cellular double-bottom principle, largely subdivided, for the greater safety of the vessel in case of stranding, for use as water ballast when coal is burnt out, and for the supply of the boilers with fresh water. The upper deck is of teak, and all deck-houses, etc., are of steel and teak, and strongly-constructed turtle decks are placed at both ends of the ship. The vessel has been built under the superintendence of Captain W. B. Seabury, commodore of the Pacific Mail Steamship Co.'s fleet, and the machinery under the careful supervision of the company's engineer, Mr. Benjamin M. Post. The vessel has accommodation for 120 first-

class, 44 second-class, and 1,000 third-class passengers in a handsome and elaborate manner, while special attention has been paid to ventilation. The *China's* outfit, which is complete in every respect, includes electric light, refrigerator, steam and hand steering gear, full complement of life-boats, etc. She will be rigged with four masts.

**Rei de Portugal.**—On July 1st Messrs. Scott & Co., ship-builders, Greenock, launched from their shipbuilding yard at Carsdyke a large and beautifully-modelled steel screw steamer, of 3,400 tons net register, for the Mala Real Portuguesa, of Lisbon. The following are the dimensions:—Length, 350 ft.; breadth, 42 ft.; and depth, 28 ft. 6 in., moulded. The steamer on leaving the ways was named *Rei de Portugal*, by Senorita Elvera de Vasconcellos. She was shortly afterwards taken in tow by two of the Clyde Shipping Co.'s tugs and taken to the Victoria Harbour, where her engines and machinery will be put on board, and where she will be fitted out for sea. The *Rei de Portugal* has been built under special survey, is classed 100 A 1 at Lloyd's, and is intended to trade between Lisbon and the Portuguese colonies in Africa. Her engines, which will be supplied by the builders, are on the triple-expansion principle, and are of 4,000 I.H.P. The steamer will be equipped with all the latest improvements, and will be fitted up with refrigerating machinery and chambers, electric light, etc. She has accommodation for 75 first-class, 21 second-class, and 120 third-class passengers, and 240 soldiers. This is the second of the fleet of five steamers to be built by Messrs. Scott & Co. for the same owners, and intended for the same service.

**Bayonne.**—On July 2nd the oil bulk-carrying steamer *Bayonne*, built by A. & J. Inglis, Pointhouse Yard, Glasgow, for the Bayonne Steamship Co., London, was launched. Dimensions:—330 ft long, 42 ft. beam, and 29 ft. 6 in. depth. She is divided into 18 compartments below the main deck, and will carry 4,000 tons of oil in bulk. She is fitted with water ballast arrangement, clear of the oil compartments, for regulating the trim of the vessel as the coals are consumed; and has bunker capacity for over 500 tons of coals. A perfect system for ventilating the oil compartments will be fitted. The vessel is fitted with very powerful oil pumps by Garrison & Guild, of New York, which are capable of discharging the whole of her cargo in less than 10 hours. She will be lighted throughout by Clarke, Chapman & Parson's system of electric lighting, and is fitted with Muir & Caldwell's steam steering engine, and Napier's steam capstan on poop. The specification, design, and inspection of the vessel and machinery has been carried out under the superintendence of Mr. G. Eldridge, London. Her machinery, also by the builders, is of the latest triple-expansion type, having cylinders 24 in., 40 in. and 63 in. diameter, with a stroke of 42 in., and supplied with steam from two large steel boilers working at a pressure of 160 lbs. per square inch.

**Hopper Dredger.**—On July 4th Messrs. William Simons & Co. launched complete from their yard at Renfrew, one of their patent hopper dredgers, constructed to the order of the Harbour Department, Board of Trade, Whitehall, London, to be employed in dredging Ramsgate Harbour. The vessel is constructed with the latest improvements, and has a hopper capacity for 300 tons of its own spoil. The bucket ladder dredges to a depth of 28 ft. under water level, and the buckets have a lifting capacity of 250 tons per hour. The builders have in progress two powerful dredgers for the Melbourne Harbour Commissioners, and a hopper dredger to be employed in the removal of the bar at Alexandria Harbour; also, a patent elevating ferry steamer for cross-river communication at Finnieston, Glasgow.

**Philomel.**—On July 11th a fine paddle passenger steamer was launched from the shipbuilding yard of Messrs. John Scott & Co., Abden, Kinghorn. The vessel, which has been built to the order of the General Steam Navigation Co., London, is of the following dimensions:—Length, 242 ft.; breadth, 27 ft.; depth, 10 ft. She is built of steel throughout, and is fitted up with triple-expansion engines, and direct acting wire rope winlass, by Emerson, Walker & Co. She is one of five built at Kinghorn within the last few years for the same company, and is in many respects the finest of them all. She is expected to attain a speed of 20 miles an hour. She was launched with steam up, and was conveyed by tug to Granton. On leaving the ways she was named the *Philomel* by Miss Cumming, daughter of Mr. W. C. Cumming, Resident Magistrate, Mount Frere, South Africa.

**Norna.**—On July 13th Messrs. S. & H. Morton & Co. launched from their yard at Leith a steel screw steamer, 232 ft. in length, 33 ft. in breadth, and 16 ft. in depth, built to the order of Messrs. J. T. Salvesen & Co., shipowners, of Grange-mouth. The steamer, which is intended for the Baltic trade, will be fitted by the builders with triple-expansion engines, steam winches, patent windlass, and all modern improvements. She was named the *Norna* by Mrs. Salvesen, of Blair Bank, Polmont, wife of the managing owner.

**Realm.**—On July 15th there was launched from Messrs. Ramage & Ferguson's shipbuilding yard, at Leith, a steel screw steamer named the *Realm*, built to the order of Messrs. R. Conaway & Co., Liverpool. Dimensions:—265 ft. by 36½ ft. by 18 ft. 4 in., moulded, and having poop, raised quarter-deck, long bridge, and top-gallant fore-castle. The engines, which are also made by Messrs. Ramage & Ferguson, are triple-expansion, having cylinders 21 in., 34 in., and 56 in. diameter, by 36 in. stroke, and are supplied with steam from two steel boilers, working up to 160 lbs. pressure. She is fitted with patent direct steam windlass by Emerson, Walker & Co. The *Realm*, which has been built under the superintendence of Messrs. Ashlin & Asbridge, Liverpool and London, on being launched, was named by Miss Sanderson, Bonnington. The builders have on the stocks a duplicate steamer, which is expected to be launched in a few weeks.

**Kaviana.**—On July 16th the Ailsa Shipbuilding Co. launched a steel screw steamer for the British India Steam Navigation Co., Limited, being the first of a series of six steamers which they have in hand for that company. Her dimensions are:—240 ft., by 34 ft. by 25 ft., moulded to shade deck. She has been built under special survey at Lloyd's, and will be classed 100 A 1. She has a poop aft fitted with accommodation for first-class passengers, bridge-house amidships for second-class passengers and officers, and topgallant fore-castle forward for crew and offices for native passengers. She is schooner-rigged, is fitted with steam steering gear, steam windlass, improved helical steam winches for working the cargo, and all the latest appliances, including electric light throughout the ship. The engines, which are being constructed by Messrs. Dunsmuir & Jackson, Govan, are of large power, and the vessel is intended to attain a high rate of speed. The naming ceremony was performed by Mrs. James Napier, The Drum, Old Kilpatrick, the vessel being named *Kaviana*.

**Ribago.**—On July 22nd Messrs. David J. Dunlop & Co., engineers and shipbuilders, Port Glasgow, launched a steel paddle steamer of 450 tons gross, and of the following dimensions:—Length, 192 ft.; breadth, 29 ft.; and depth, 9 ft. The new vessel has been built to the order of the Royal Niger Co., Chartered and Limited, of London, for up-river service on the West Coast of Africa, and on leaving the ways she was named the *Ribago*. She is a sister ship to the *Kano*, built by Messrs. Dunlop & Co. in 1882 for the same owners. The *Ribago*, which is furnished with all modern appliances, including steam steering gear, steam cranes and windlasses, will be fitted with two sets of compound disconnecting or side lever engines of about 600 H.P. She is expected to leave for her destination in the course of from 10 to 14 days.

#### LAUNCHES—IRISH.

**Queensmore.**—On June 26th a large steel screw steamer, the *Queensmore*, was successfully launched by Messrs. Harland & Wolff from one of the slips at the north end of the Queen's Island, Belfast. The dimensions of the new vessel, which is built to the order of Messrs. William Johnston & Co., of Liverpool, are:—Length, 400 ft.; breadth, 46 ft.; depth, 32 ft.; gross tonnage, about 4,300. She will be fitted with triple-expansion engines, and will be furnished with all the most approved gear and appliances for the efficient working of the cattle-carrying trade between Baltimore and Liverpool.

**Majestic.**—On June 29th the White Star Royal Mail steamer *Majestic*, twin ship to the *Teutonic*, launched in the beginning of the year, was successfully launched from Messrs. Harland & Wolff's yard at Belfast. As the *Teutonic* and the *Majestic* are the largest merchant vessels afloat, the following particulars may be interesting:—The length of the ships is 582 ft.; breadth, 57 ft. 6 in.; depth, 39 ft. 4 in.; with a gross tonnage of nearly 10,000. They are built of Siemens-Martin steel, and are propelled by two independent sets of triple-expansion engines, constructed by Messrs. Harland & Wolff, driving twin

propellers with manganese bronze blades. In form and construction of hull they possess all the distinctive beauty of outline and strength which characterised their predecessors, the *Oceanic*, *Adriatic*, *Britannic*, *Germanic*, &c., with the addition that, while they are as minutely subdivided by athwartship bulkheads, they are also constructed with a longitudinal bulkhead running fore-and-aft throughout the greater portion of their length, giving additional rigidity and strength to their structure, and greatly increasing the security of the ships in the event of collision. Though similar in hull and outline to the present White Star ships, and having two funnels only, the masting of the *Teutonic* and *Majestic* is different. Three large taunt pole masts, entirely without yards, take the place of the familiar four masts with full equipment of square canvas, the application of twin screws rendering the larger amount of sail power superfluous. These vessels are not intended to carry an excessive number of saloon passengers. Their limit for that class is 300, and provision is made for all this number to dine at one time. There is also accommodation for 150 second cabin passengers and about 750 steerage. In the *Teutonic* and *Majestic* the saloon and sleeping accommodation have been placed in the very middle of the ship, both as regards length and depth, where there is the minimum of movement. The hurricane or promenade deck is 245 feet long, with a clear width of 18 ft. on each side of the deck houses, and is free of all obstruction, the boats being placed on an awning deck on top of this again, which will serve as a permanent shelter in place of the canvas now used for that purpose. On the promenade deck, besides the usual accommodation for the commander, there are state rooms for passengers' use, having direct communication with the decks below. A pantry is provided for the deck steward to facilitate his attendance on passengers who may be "under the weather;" also an entrance to the gentlemen's smokeroom, lavatories, etc. Adjoining is the main entrance to the library. On the upper deck, in addition to the purser's quarters, there are deck state rooms for saloon passengers, furnished with baths, etc. Further aft will be found the gentlemen's lavatory, the barber's shop, and the first-class smokeroom. On the main deck, the principal saloon, apart from its size, presents many novelties, both in design and construction. In general the decoration is of the Renaissance period, and the prevailing tones ivory and gold. The walls are pencilled out by shallow moulded framework, highly enamelled and slightly relieved with gold, whilst the panels in this framework are executed in a glyptic material, in which tritons, nymphs, and other oceanic symbols appear. The figures in relief have an ivory-like surface and tint, and the groundwork of the panels is of gold. The ports are lined with repoussé brasswork of the same Renaissance character as the walls, and are fitted with stained-glass blinds emblazoned with the arms of the principal States and cities of America, Canada, and Europe, behind which is placed electric lights, so that the brightness of the design will be apparent by night or day. The ceiling, like the walls, is done in ivory and gold, richly ornamented, the electric light being introduced into the ornamentation of the ceiling in place of the usual hanging lamp. Forward of the saloon, and also immediately below it, there are the first-class state rooms. A large proportion of these will be two-berthed rooms only, and so arranged that there shall not be both upper and lower berth in the same room. Numerous rooms of large size for families are provided, as well as rooms suitable for a single passenger only. In every state room an effort has been made to give an attractive and home-like appearance to its furniture by means of easy chairs, chests of drawers, hanging cupboards, etc., and, as is now almost universally the case, the electric light in each room will be under the control of the occupant, and available at will. Ample bath and lavatory accommodation of the most modern description is provided closely adjoining each section of the saloon quarters; also a good baggage room, easily accessible for articles wanted on the voyage. Aft the main saloon, on the one side, have been arranged the first-class pantry, galley, baker's shop, scullery, bread room, and butcher's shop, the last with direct access to the refrigerating chamber immediately below, in which will be kept the fresh stores. In the other side of the ship are state rooms leading aft to the accommodation for the second-class passengers. The rapid growth of the second-class section of the Atlantic passenger trade has necessitated considerable changes from time to time, and in the *Teutonic* and the *Majestic* an endeavour has been made to provide accommodation of such a character as will, beyond doubt, compete successfully for this class of business.

Comfortable state rooms, in no way inferior to the old-fashioned first-class accommodation, a dining saloon on the upper deck (with smokers room above), a promenade deck set apart for their own use, and good baths and lavatories, have all been provided. The arrangements for steerage passengers have always been a special feature in the White Star steamers. The complete isolation of the single men and women at each end of the ship, and of the married people in their own quarters in two and four berth rooms, separate entrances, closets and lavatories for each division, a bath for the women and children, and a smokers room for the men, have all been arranged for, while the steerage pantry will enable a constant supply of hot water and other comforts to be maintained for those who need them. In common with all other parts of the ship, the steerage will be lighted by electricity throughout.

**Adula.**—On July 11th the steel screw steamer *Adula* was launched from the building yard of Messrs. M'Ilwaine & M'Coll, Limited, at Belfast. The *Adula* has been built to the order of Messrs. Leach, Harrison & Forwood, of Liverpool, and is specially adapted for service in the West Indies in their Atlas Line. She is 212 feet long, 29 feet beam, and 12 feet depth of hold, with a shade deck, having on it airy and well-ventilated accommodation for a large number of first-class passengers. The builders are supplying triple-compound three-crank engines, having cylinders, 18, 30, and 49 in. diameter and 33 in. stroke, with two large steel boilers working 160 lbs. pressure.

**Uranus.**—On July 11th Messrs. Workman, Clark & Co., Limited, launched from their shipbuilding yard, Spence Basin, Belfast, a handsomely-modelled screw steamer, built to the order of Messrs. Coates & Carver, Manchester, for the firm of Macleod, Manila. The dimensions of the vessel are:—Length, between perpendiculars, 222 ft. 1 in.; breadth, moulded, 32 ft. 6 in.; depth, moulded to awning deck, 24 ft. 1½ in. She will be classed 100 A 1 at Lloyd's, under special survey, with a Board of Trade passenger certificate. The vessel is of the awning deck type, and has been designed for the passenger, mail, and coasting trade generally in the China Sea. In addition to the ordinary steering gear she is supplied with Harrison's patent steam steering gear, placed in a wheel-house on the flying bridge. The boats, of which there are eight, are carried on skids at the height of flying bridge, and are fitted with patent disengaging gear. In view of the tropical climate in which she will mostly be engaged, the vessel is supplied with Green's patent system of ventilation to both cabin and cargo spaces. A special feature is an arrangement for extinguishing fire, the apparatus being placed in the boiler rooms, and having branch pipes to 'tween decks and holds. She will be rigged as a two-masted schooner, with three yards on foremast, and has a complete awning over the deck from stem to stern. The passenger accommodation is on the main deck aft, and consists of a spacious saloon, which will be fitted up in polished oak, with gilt cornices. There is dining accommodation for 80 passengers, and the state rooms are arranged on either side of the entire length of the saloon. The various rooms are fitted with electric light and bells. The second-class passengers and crew are berthed forward in compartments on the main deck, and the captain and officers in a house on the awning deck amidships. The christening ceremony was performed by Miss I. F. Macleod, the vessel being named the *Uranus*. The *Uranus* has been built under the personal supervision of Mr. J. B. Mustard, and will leave for Glasgow shortly to have her machinery fitted by Messrs. Muir & Houston. The engines are of the triple-expansion type, with cylinders of 23 in. by 37 in. and 60 in. diameter respectively, with a stroke of 39 in., and I.H.P. of above 1,400. The boilers are of steel, and are three in number, having a working pressure of 160 lbs.

### TRIAL TRIPS.

**Merqueder.**—On June 29th the new screw steamer *Merqueder*, built by the Campbelltown Shipbuilding Co. to the order of Messrs. Mercader & Lijos, of San Sebastian, was taken on her trial trip. The mean speed during two runs on the measured mile at Skelmorlie was 12.1-10 knots. The *Merqueder* is a vessel 223 ft. extreme length, 215 ft. between perpendiculars, by 31 ft. beam, by 15 ft. depth in hold. She has raised quarter-deck, bridge-house for accommodation of officers, topgallant fore-castle, and Sir William Thomson's patent compass. She is built of iron, and is schooner-rigged. She has triple-expansion engines

indicating 856 H.P., three steam winches, Harfield's patent windlass, large main and donkey boilers, and every facility for carrying on the trade which the owners have in view. The construction of the machinery has been carried out under the superintendence of John Wilson, Esq., consulting engineer, Glasgow.

**Stanwick.**—On June 29th the new screw steamer *Stanwick*, which has been built at the yard of Messrs. T. & W. Smith, North Shields, to the order of Messrs. Eccles & Dryden, Quay-side, Newcastle, was taken to sea for her official trial. The *Stanwick* is a well-modelled vessel, and of excellent arrangement for general carrying. Her dimensions are:—Length, 225 ft.; beam, 32 ft. 6 in.; and depth, 15 ft. 9 in.; and her deadweight capacity is of 1,550 tons. She is engine on the triple-expansion principle, and her cylinders are 16½ in., 27 in., and 44 in. respectively, with 33 in. stroke, by Messrs. J. P. Renoldson, of South Shields. The boiler is built by Mr. J. T. Eltringham, and works at a pressure of 160 lbs. The vessel is fitted with the usual complement of winches and kindred machinery for quick working, all of which are on the most improved principle. After several runs over the measured mile, a mean speed of 10½ knots was reported, the engines indicating 650 H.P., the whole of the machinery giving complete satisfaction.

**Glencairn.**—On June 29th the screw steamer *Glencairn*, built by Messrs. John Priestman & Co., of Southwick, for Mr. R. Livingstone, of West Hartlepool, left the Wear for her trial trip. The vessel is fitted with triple-expansion engines by Messrs. Hutson, Corbett & Co., of Glasgow, which during the trial worked with perfect smoothness and regularity, the ship attaining a speed of about nine knots. This was considered satisfactory, seeing that the ship was fully laden. Mr. Craig, of West Hartlepool, was present during the trial on behalf of the owners.

**Columbia.**—On June 29th the new twin-screw steamship *Columbia*, constructed for the Hamburg-American Steam Packet Co. by Messrs. Laird Brothers at their building dock, Birkenhead Ironworks, ran her final trial trip. This being the largest merchant steamer that has yet been built on the Mersey, she has been a great attraction, not only to those particularly interested in shipping matters, but to all who have had an opportunity of making an inspection. The vessel is constructed entirely of steel, and it goes without saying that in preparing the designs the best efforts of most able experts have been put forth. The ship was built under the superintendence of Mr. Otto Schlick (consulting engineer of the company), Hamburg, Captain Meyer, and Mr. Ritschard (chief engineer inspectors), and Mr. A. Wimmel (resident superintendent of the work). No pains have been spared to promote thorough efficiency, the maximum of seaworthiness and speed, as well as the comfort and safety of passengers and crew. There is apparatus of the very best known kind for saving the lives of all on board in case of collision, and numerous expedients have been adopted with a view to making the hull practically unsinkable. The frames and bow plating are of extra strength, to withstand the pressure of ice. Each set of engines and each group of boilers and coal bunkers is in a distinct watertight compartment. Each set of machinery, with its own steel shafting and propeller, being thus isolated, should one set be disabled in any way, the other could move the vessel on her way with maximum speed diminished by less than one-third. The duplicating system is carried out even in the electric lighting machinery, Messrs. Siemens & Halske, of Berlin, having fixed on board an installation of no less than 750 lights. The engines are on the triple-expansion principle, with cylinders of the respective diameters of 41 in., 60 in., and 101 in., with 5 ft. 6 in. stroke. Steam is supplied from nine cylindrical boilers, fitted with a total of 54 Purves' patent ribbed furnaces, to work at 150 lbs. steam pressure, and develop 12,500 H.P., which was the contract limit; but on the trial this was greatly exceeded, as much as 13,680 I.H.P. being reached. Several runs were made on Saturday, the 29th June, when the mean speed attained was 19 knots, with 74 revolutions of the screws per minute. Both screws were tested together, then separately, and the machinery was all closely examined and subjected to severe trial by the representatives of the company. When both screws were in full action there was much less vibration perceptible than was expected with a ship of such dimensions. She has been coated with Hartmann's Rahtjen's composition. There were on board during the trip representatives from Hamburg, London, Liverpool, and other places, of the Hamburg-American Steam

Packet Co., the German Imperial Navy, the Argentine Navy, Panama Railways, Bureau Veritas, and of the Allan, Amard, Inman, and International, and many other well-known lines of steamers. The representatives of the company expressed themselves completely satisfied with the vessel, and Mr. William Laird received hearty congratulations on the achievement of his firm. In proposing success to the *Columbia* and her owners, Mr. Laird referred to the great progress that had been made of late years in Transatlantic travelling, and to the rapidity with which voyages to and from America were now made. When his firm undertook the building of the *Columbia*, they knew they were engaging in friendly competition with very able shipbuilders and engineers in Germany, but they felt it was an honourable competition, and determined to do all they could to uphold not only the credit of their firm, but to take care that the results of English industry should not fall short of what could be done on the Continent. It was most encouraging in carrying on their work to know that they were trusted by influential firms such as the Hamburg-American. After making her speed trials on the Mersey, she steamed round to Hamburg where other trials were made, giving even higher results. She sailed from Hamburg to New York on her maiden voyage on Thursday, July 18th, calling at Southampton, which port she left on the morning of the 20th. Her run from the Elbe Light to the Nab had been made at a speed of upwards of 18½ knots an hour against a strong head wind and heavy sea, and the report of her performance across the Atlantic is looked for with interest.

**Horrox.**—On July 1st the screw steamer *Horrox* proceeded down the river for her official trial trip, after having had her machinery converted from the compound to the tri-compound system by Messrs. David Rollo & Sons, of the Fulton Engine Works, of Liverpool. The *Horrox* has been supplied with two boilers, with a working pressure of 150 lbs. per square inch, also a new donkey boiler, and winches. The diameters of the cylinders are 21½ in., 34 in., and 55 in. respectively, the length of stroke being 42 in. The engines will exert sufficient power to maintain fully a knot more speed than previously, and yet a hold capacity of 6,000 cubic ft. has been given up to cargo, the machinery space having been reduced by this extent. The following are the vessel's dimensions: 281 ft. long, 34 ft. beam, 24 ft. depth of hold; her gross tonnage is 1,714. She is owned by Messrs. Lamport & Holt, and it may be mentioned that Messrs. Rollo & Sons have on hand a set of their well-known triple-expansion engines of 1,600 I.H.P. to replace the present compound engines in another of the company's vessels. The trial of the *Horrox* gave every satisfaction, the engines working smoothly and well during the day's run.

**Ayrshire.**—On July 2nd the screw steamer *Ayrshire*, which has recently been purchased by Mr. Walter Runciman, of South Shields, from Messrs. Turnbull & Martin, of Glasgow, had a trial trip previous to going on a voyage to Algiers. The vessel, which is of 2,200 tons deadweight, has been thoroughly renewed, having received boilers and engines which are practically new ones, besides undergoing other alterations and improvements before coming into the hands of her present owner. She now steams nine knots per hour on a consumption of 10 tons of coal a day.

**Semiramis.**—On July 3rd this magnificent new steel screw steam yacht went on her official trial trip on the Firth of Forth, her performances fully realising the owner's and builders' expectations. Besides being the largest steam yacht yet built at Leith by Messrs. Ramage & Ferguson, the *Semiramis*, which has a tonnage of over 700 tons yacht measurement, is the third vessel her owner, Mr. Lysaght, of Bristol, has had from the same yard, his former yachts, the *Titania*, 300 tons, and *Candace*, 400 tons, having been respectively sold to the Marquis of Ailsa and the British Admiralty. The dimensions of the *Semiramis* are:—Length for tonnage, 204 ft.; breadth for tonnage, 27-15 ft., and depth, moulded, 16 ft. The engines, which have also been constructed by Messrs. Ramage & Ferguson, are triple-expansion, with cylinders 18 in., 29 in., and 47 in. diameter, by 33 in. stroke, supplied with steam at 160 lbs. pressure from a large steel double-ended boiler, and capable of driving the yacht in cruising trim at a seagoing speed of 12 to 13 knots per hour. Besides her machinery, this yacht will also to some extent depend on her sails in cruising, the rig being that of a topsail schooner, while a steam capstan-windlass, by Emerson, Walker & Co., and steam steering gear add to her handiness in working. As might be expected in a vessel of this size, the cabins are exceptionally fine. The main saloon is situated forward, and a

striking effect is produced by the adaptation of a mediæval style of decoration, the panels being of leather, having hunting figures painted on them, with a gold mosaic background. The furniture and framework throughout are of fumed mahogany, and the upholstery is chiefly finished in olive tapestry velvet. The owner's and ladies' cabins are situated abaft of the main saloon, and are finished in similar style in bird's-eye maple, oak and fumed mahogany. Forward of the saloon are additional state-rooms, and the crew are berthed in the fore-castle. Aft of the engines there is a spacious bachelor's cabin, with fine state-rooms, and a bathroom opening from it, the officers and engineers being berthed in the after end of the vessel. On deck there are two separate deckhouses, besides an iron house containing the entrances to engine-room and stokeholes, besides a large galley and drying room, while above is a spacious promenade deck. An installation of electric lighting has been fitted up throughout the vessel by Messrs. King, Brown & Co., Edinburgh. The *Semiramis* is classed 100 A 1 at Lloyd's, and has been designed by the well-known naval architect, Mr. Alfred H. Brown, of Pall Mall, London, W., who also superintended her construction. A large party of ladies and gentlemen joined the *Semiramis* at Leith, and after taking in stores, etc., the yacht sailed at 8 p.m. for Bergen, Norway, after which she will proceed to the North Cape.

**Galatea.**—On July 3rd the new saloon steel paddle-steamer *Galatea*, built by Messrs. Caird & Co., Greenock, for the Caledonian Steam Packet Co., went on her official trial trip, and obtained results which at once placed her in the front rank of the Clyde passenger fleet. She is 230 ft. in length; 25 ft. in breadth; and 8 ft. deep, and, with a straight stem and beautifully-modelled elliptic stern, the *Galatea* possesses in a high degree, in conjunction with a strongly-constructed hull, those symmetrical proportions which are so noticeable in all the vessels built in Messrs. Caird & Co.'s yard. She has a flush main deck, with deck saloon houses fore and aft. Her hurricane deck is amidships, in a line with the saloon deckhouses, and forms, in conjunction with them, a continuous and unbroken promenade deck 200 ft. long, and occupying the full breadth of the ship. The upholstery work of this fine steamer is by Messrs. J. G. Rowan & Co., Greenock, and is without doubt the finest in any new steamer on the Clyde. Her engines and machinery were constructed at the builders' engineering establishment in Arthur Street. She is supplied with a pair of fixed diagonal surface-condensing engines of about 2,000 I.H.P., the diameter of the two cylinders being 34 and 64 in. respectively, with a piston stroke of 6 ft. Steam is supplied from four horizontal boilers, the pressure being 110 lbs. to the square inch. Amongst other appliances on board for the efficient working of the vessel are Messrs. Muir & Caldwell's steam-steering gear and two of Gwyne's force draught centrifugal pumps on the close stokehole principle. The engine and docking telegraph, patented by Messrs. Chadburn & Son, Liverpool, is fitted up on the bridge. Steaming against a strong breeze of wind, the *Galatea* covered the measured mile at the rate of 17-36 knots an hour—a result which, in view of the fact that the engine-power was not fully developed, was deemed so eminently satisfactory that further trials were dispensed with.

**Lady Gwendoline.**—On July 3rd this steamer, built by Messrs. James M'Arthur & Co., of Paisley, and engined by Messrs. Bow, M'Lachlan & Co., of the same town, went down the Firth on her official trial. The vessel is 220 ft. long over all, by 23 ft. broad by 9 ft. deep, moulded. The engines are of the diagonal compound surface-condensing type, with two navy boilers. They are arranged to work with forced draught on the closed stokehole system, and have all the latest improvements, including automatic boiler-feeding arrangements. The vessel steamed continuously for six hours, covering the Cloch and Cumbrae Light several times, and also going over the measured mile at Skelmorlie. The engines worked smoothly, with 42 revolutions, a boiler pressure of 108 lbs., and a vacuum of 28 in. A speed of 18-136 miles was obtained, being fully one mile over her guaranteed speed. The *Lady Gwendoline* is fitted with all recent improvements for the easy working of the vessel, and has the engineers' patent steam steering gear, steam windlass, etc., fitted on board. The vessel is intended for opening up a new route for passengers from Bristol and Cardiff to Ilfracombe and the other towns on the north-west coast of Devonshire.

**Magdalena.**—On July 4th the official trial trip of the steamship *Magdalena* took place. This is the second of four vessels of equal proportions building by Messrs. R. Napier & Sons for the Royal Mail Steam Packet Co., London. She has been

specially designed to meet the requirements of the company's Brazil and River Plate service, and as speed is an important element, the hull has been built of fine lines, with a handsome clipper bow and figurehead, which give the vessel a most symmetrical appearance. The general dimensions of the *Magdalena* are as follows:—Length over all, 446 ft.; breadth, extreme, 50 ft.; depth to spar deck, 33 ft. 6 in., with a gross tonnage of about 5,300 tons. The vessel is built of steel, classed A 1 at Lloyd's, and is designed to attain a high rate of speed with the greatest possible economy. The builders have supplied a set of triple-expansion engines fitted with all the most modern improvements, steam being supplied by eight single-ended boilers with a working pressure of 150 lbs. to the square inch. The engines are fitted with Kirk's patent safety valves. The accommodation for the passengers is of the most sumptuous and complete description, and all the details have been carefully considered with special reference to a first-class passenger service in a hot climate. This accommodation consists principally of a dining saloon, a music-room, a ladies' boudoir, a smoking-room, and state rooms for about 200 first-class passengers; a dining saloon, a ladies' room, a smoking-room, and state-rooms for 40 second-class passengers, with ample and comfortable accommodation for 400 third-class passengers. The entire passenger accommodation is heated by steam, and the electric light is fitted in every part of the ship. The result of the trials on the measured mile gave a mean speed of 17½ knots, which was attained on four runs, being 1½ knots in excess of the contract speed. This result was considered very satisfactory by the builders, and by Captain Bevis and Mr. Bowers, who represented the Steam Packet Co.

**Mortlake.**—On July 4th the large screw steamer *Mortlake*, built by Messrs. William Gray & Co. for Messrs. Watts, Ward & Co., of London, went on her trial trip off Hartlepool, previous to proceeding to Cardiff to load. The vessel is built of steel, her dimensions being:—Length, 310 ft.; breadth, 41 ft. 6 in.; depth, 23 ft. ½ in., and she is classed 100 A 1 at Lloyd's. Her engines are of the triple-expansion type, of 1,100 I.H.P., constructed at the Central Engine Works of Messrs. William Gray & Co. The vessel proceeded to sea on the early morning tide, and after adjusting compasses had a run out to sea and back again of several hours' duration, the log indicating a speed of 11 knots per hour. The engines were run at a speed of 83 revolutions per minute, without any water on the bearings, everything running perfectly cool throughout the whole trial. The vessel was superintended during her construction by Captain J. A. Hodgson, and the machinery by Mr. A. H. Alchin, superintending engineer to Messrs. Watts, Ward & Co. These gentlemen were on board at the trial trip, and expressed themselves highly satisfied with the performance of the ship and her machinery. A telegram was subsequently received showing that she passed Dover just 24 hours after leaving Hartlepool Bay, and she reached Cardiff in 63 hours, giving a speed of over 11 knots.

**Alarich.**—On July 5th the *Alarich*, the second of four steamers building by Messrs. William Gray & Co., Limited, for Herr Johannes Lange, of Kiel, proceeded on her trial trip off Hartlepool, having on board Mr. William Menzies, of Newcastle, the superintendent engineer in this country for Herr Lange, under whose superintendence the machinery has been constructed. The engines were run at a speed of 88 revolutions per minute, everything running quite cool without water, and giving the highest satisfaction to all concerned. The vessel, on the measured mile, accomplished a speed of 10½ knots per hour.

**Collingham.**—On July 6th the s.s. *Collingham*, which has been built by Messrs. Raylton, Dixon & Co. for Messrs. Harris & Dixon, of London, took her trial trip from the Tees. This vessel's dimensions are:—Length over all, 305 ft. 3 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in.; with a deadweight capacity of 3,650. Her engines, which have been built by the North-Eastern Marine Engineering Co., Wallsend, worked most satisfactorily, a speed of 12 knots being maintained. After trial, the vessel returned to Middlesbrough to load for China. The *Collingham* has been built under the superintendence of Mr. Walter Phillips, consulting engineer, who represented the owners on the occasion.

**Empress.**—On July 6th the new steamer *Empress*, recently launched by the Grangemouth Dockyard Co. at Alloa, and engined and completed at its Grangemouth yard, went down the Firth on her official trial trip. Over the measured mile a speed of over 11 knots was obtained. The *Empress* is a handsomely-modelled steel screw steamer, 250 ft. by 34 ft. by 17 ft. 6 in., and built to the order of the new Biscay Steamship Co. for the

Baltic general trade. The engines, which are of the triple-expansion type, were supplied by Messrs. Watson & Corbett, Kelvinhaugh Engine Works, Glasgow.

**Arbutus.**—On July 8th the steamer *Arbutus*, owned by Mr. Robert Taylor, of Dundee, Montrose, Aberdeen, &c., left the Manor Quay Works of Messrs. J. L. Thompson & Sons, Sunderland, where she has undergone extensive repairs and renewals. She received, among other improvements, new compound engines of 75 N.H.P., cylinders 20 and 36 by 28 in. stroke, and working at a boiler pressure of 80 lbs. per square inch. The vessel being put on her merits for a full-speed trial, the following results were obtained:—Steam, 80 lbs.; revolutions, 114; speed of ship, 11·92 knots. The machinery worked throughout with perfect smoothness, and gave every satisfaction.

**Emerald.**—On July 10th the new screw steamer *Emerald*, lately launched by Messrs. John Fullerton & Co., shipbuilders, Merksworth, Paisley, being the latest addition to the fleet owned by Mr. Wm. Robertson, Great Clyde Street, Glasgow, went down the Clyde on a trial trip. After adjusting compasses at Gareloch, the steamer was put on the measured mile, her speed being 11½ knots, which was considered highly satisfactory. The engines, which were supplied by Messrs. Muir & Houston, Portman Street, Kinning Park, Glasgow, are on the triple-expansion principle, with all the latest improvements, and worked admirably during the trip.

**Torpedo Boat No. 85.**—On July 10th the official trial was commenced of one of the series of six first-class torpedo-boats which are being constructed for the British Government by Messrs. Yarrow & Co., Poplar. Three boats of this series have already been completed, the present vessel, which is known as No. 85, being 135 ft. long with a beam of 13 ft. 6 in., the same dimensions in fact as her five sister vessels. The trials took place in the Thames between Millwall and the Lower Hope, Mr. Crohn, representing the builders, having charge of the boat. Mr. Smale and Mr. Melrose were on board representing the Admiralty, while Mr. Wishart and Mr. Batt represented the Portsmouth authorities. The Admiralty attached extra requirements to the contracts for these boats, which are best shown by a comparison of the new vessels and the type immediately preceding them. The last order for torpedo-boats for the Government required the vessels to have a guaranteed speed of 19 knots on a run of two hours continuously and a load of 10 tons. The average speed of these boats, known as the No. 79 type, when commissioned has been 17 knots, and they were attached to the A squadron in last year's manoeuvres. Their successful working, and the advances made in torpedo boat building, justified the Admiralty in demanding much higher results—namely, that in vessels of an improved No. 79 type there should be a run of three hours' duration in place of two, a carrying power of 20 tons in place of 10, and a minimum speed on trial of 21 knots in place of 19. The armament of the new boats consists of a bow torpedo gun, with direct head fire, and two torpedo guns aft, secured to revolving turntables for side fire—these two guns being placed at a small angle to each other on a plan invented by Messrs. Yarrow, so that, if both aft torpedo shots are fired at the same time, they take slightly divergent courses, without the chance of spending their force against themselves. The bow gun is completely covered by a turtle back, and within this compartment is the accommodation for the crew of thirteen, the three officers having their quarters in the after part of the vessel. The other armament consists of three powerful machine guns. The machinery occupies the centre of the vessel, and consists of engines of the Yarrow type, averaging from 1,100 to 1,150 H.P. The boilers are of the modified loco-marine type. The trials on Wednesday included two runs of three hours each, and turning circles on both the port and starboard, so as thoroughly to test the manoeuvring powers of the vessel. The speed trials of the other three vessels, Nos. 82, 83 and 84, have given very even results—namely, 22·53 knots, 22·57, and 22·64 respectively. The full trials of No. 85 could not be completed on Wednesday, but will be finished on another day.

**Knight Templar.**—On July 11th the new steamship *Knight Templar* was taken out from Messrs. Palmer & Co.'s jetty at Jarrow on her trial and compasses adjusting trip. The *Knight Templar* is a schooner-rigged screw steamer, 400 ft. in length between perpendiculars, 47 ft. beam, and 30 ft. 3 in. in depth. She is fitted up with every convenience for the officers and crew, including L. Utley & Co.'s (Liverpool) patent ventilators. These ventilators have automatic action, and are always in

operation unless when the water—which cannot enter—prevents the ingress of air. These ventilators act all over the ship, both in crew and cargo spaces. The engines are of the triple-expansion type, the diameter of the cylinders being respectively 76, 47, and 29 in., with a 57-in. stroke and a pressure of 150 lbs. to the square inch. After steaming about for some time the measured mile was run over four times, the average speed being 13½ knots an hour.

**Embiricos.**—On July 11th the s.s. *Embiricos*, built and engined by Messrs. MacIlwaine & McColl, Limited, went on her trip, and after a thoroughly satisfactory test, sailed for Cardiff, at which port she docked the following evening, having steamed the distance—not less than 300 miles—in 25 hours, or about 12 miles per hour. The *Embiricos* has been built for Mr. A. Embiricos, of Braila, specially for grain carrying, from the specifications and under the superintendence of his consulting engineers, Messrs. William Esplen & Son, Liverpool. She is of the "well deck" type, 275 ft. long by 38 ft. beam, moulded, and 17 ft. 3 in. depth of hold, and is built entirely of steel, and classed 100 A 1 at Lloyd's, with water ballast in double bottoms, deep tank and peat tanks. The engines are triple-compound, having cylinders 21½ in., 36 in., and 59 in. diameter, by 42 in. stroke of piston. The boilers are three in number, made entirely of steel, and working at 160 lbs. pressure.

**Ville de Messine.**—On July 13th the screw steamer *Ville de Messine* left the Tyne for a trial trip. This vessel, which belongs to the Compagnie Havraise Peninsulaire, managed by Mr. Grosos, Havre, is of the following dimensions, viz.:—Length, 280 ft.; breadth, 30 ft.; draft, 19½ ft. She has had her old compound engines taken out and replaced by a set of entirely new tri-compound engines and boilers by the North-Eastern Marine Engineering Co., Limited, Wallsend. During the trial the engines ran with perfect smoothness and without any hitch whatever, giving every satisfaction to all concerned. The vessel obtained a mean speed of 10 knots, which was considered highly satisfactory. The new engines indicate 150 H.P. more than the old ones, take up less room in the ship, and burn three tons per day less coal, while the speed of the ship is increased one knot per hour.

**Philomel.**—On July 13th the paddle passenger steamer *Philomel*, built by Messrs. John Scott & Co., Kinghorn, for the General Steam Navigation Co., went on her official trial. There were present on board, representing the owners, Mr. Wilson, engineering superintendent; Captain Ellis, marine superintendent; and Captain Marshall; whilst the firm was represented by Mr. John Scott, Mr. J. W. Hall, manager of the shipbuilding yard, and Mr. Preston. The vessel was tried several times on the measured mile at Aberlady Bay, and gave satisfaction to the representatives of the owners. The *Philomel* afterwards sailed for London. She will run between London and Boulogne, carrying passengers in connection with the Paris Exhibition.

**Edward Robson.**—On July 16th the new steam trawler, *Edward Robson*, went on her trial trip. She has been built for the Humber Steam Trawling Co. by Messrs. Cook, Welton & Gemmell, being the ninth boat this firm has constructed for the company. She is sister ship to the *Excelsior*, and measures 100 ft. long, 20 ft. 9 in. beam, 11 ft. depth of hold; is fitted with steam winches, patent gangway rollers, and all the latest improvements, including a trawl fixed on each side, ready for shooting gear. Building work has been carried on under the personal superintendence of the managing director, Mr. R. Simpson. Her engines have been built by Messrs. Bailey & Leatham, of the Humber Ironworks, under the superintendence of the company's engineer, Mr. L. Simpson. They are of 45 nominal H.P., working up to about 270 indicated. She is fitted with a steel boiler (11 ft. diameter) working at a pressure of 90 lbs. The compasses were made and adjusted by Mr. Parrott. From the very first starting the engines behaved splendidly, and the distances, both going and returning, reckoning adversities of wind and tide, were covered in remarkably quick space. From the Middle to the Bull Light occupied 22 minutes (a distance of 4·8 knots); from the Middle to the Spurn Lightship 45 minutes (a distance of 10 knots), making an average speed of over 13 knots.

**Aislaby.**—On July 16th the new steamer *Aislaby*, just completed by Messrs. Ropner & Son, Stockton-on-Tees, had her trial trip from the Tees. After adjusting compasses a long run was made, when everything was found to work satisfactorily, the engine speed, we are informed, of over 11½ knots. The engines are of the triple-expansion type, of

210 H.P. nominal, having cylinders 23, 38 and 62½, by 42 inch stroke, working at 160 lbs. pressure of steam, and built by Messrs. Blair & Co., Limited, Stockton. This steamer is an addition to the fleet of Messrs. Ropner & Co. She has been built under the supervision of Captain Rooke, their marine superintendent, and will carry 4,350 tons deadweight. The steamer proceeded to the Tyne, where she will load her first cargo.

**Arabian.**—On July 17th the steamship *Arabian*, belonging to Messrs. F. Leyland & Co., went on her official trial trip, after having had new cylinders and boilers fitted for a working pressure of 150 lbs. per square inch. The engines, working at 65 revolutions, indicated 1,200 H.P., and the vessel attained a mean speed of 11·13 knots. The entire of the foregoing work has been carried out by Messrs. David Rollo & Sons, engineers, of Liverpool, under the direction of the company's superintendent engineer, Mr. Neville Evans. It may be added that Messrs. Rollo & Sons have two more steamers in hand for the same company for similar alterations.

**Haldon.**—On July 17th the new steamer *Haldon*, built by Messrs. Edward Withy & Co., Hartlepool, for Messrs. J. Holman & Sons, London, made her official trial trip in Hartlepool Bay with highly satisfactory results. The general dimensions of the steamer are:—250 ft. by 35 ft. by 17 ft., with a gross tonnage of about 1,500 tons. The ship is built of steel, and classed 100 A 1 at Lloyd's. The engines, which have been constructed by Messrs. Blair & Co., Stockton-on-Tees, are triple-expansion, with cylinders 18½ in., 30 in., and 48 in. by 36 in. stroke, supplied with steam at 160 lbs. pressure from two single-ended boilers.

**Antelope.**—On July 17th the screw steamer *Antelope*, the second of the three new steamers building by Messrs. Laird Brothers for the Great Western Railway Co.'s new service between Weymouth and the Channel Islands, made her preliminary trial trip, attaining a mean speed of 16½ knots.

**Saint Annes.**—On July 19th this ship was taken on trial from the Tees, the result proving very satisfactory. The ship, which is 175 ft. by 28 ft. by 13 ft. 6 in., has been built by Messrs. R. Craggs & Sons, Stockton, to the order of Messrs. Pile & Co., London. The engines, which are 13 in., 21 in., and 35 in., by 24 in. stroke, have been built by Messrs. Westgarth, English & Co., of Middlesbrough, and indicated 414 H.P. on trial.

**Santon.**—On July 20th the large new steel screw steamer *Santon* proceeded to sea on her official trial trip. This vessel has been built by Messrs. C. S. Swan & Hunter, of Wallsend-on-Tyne, for Messrs. Huddart, Parker & Co., Limited, of Melbourne, of the following dimensions:—315 ft. length over all by 39 ft. by 23 ft. 2 in. depth, moulded. She is built to Lloyd's highest class, and will carry about 4,000 tons when fully laden. She is constructed with cellular double bottom, six bulkheads, poop, topgallant fore-castle and long bridge, six steam winches, etc. The vessel is specially fitted for intercolonial trade, and is the fifth steamer built by C. S. Swan & Hunter for Messrs. Huddart, Parker & Co. The *Santon*, with 2,000 deadweight on board, steamed 11½ knots on a mean of four full speed runs, which was considered very satisfactory. This speed was attained without forced draught. Progressive speed trials were then made. The engines are by the Wallsend Slipway & Engineering Co., Limited, with cylinders 22½ in., 36½ in. and 60 in. by 39 in. stroke. The boilers are fitted with fans for forced draught on the closed ash-pit system. The vessel has been built under the superintendence of Mr. John Wotherspoon, of Port Glasgow, and Captain Thorpe, who will command the vessel. Captain T. E. Webb, one of the directors of the company, was on the trial, and expressed himself highly satisfied.

**Reindeer.**—On July 23rd the s.s. *Reindeer*, built by Messrs. Craig, Taylor & Co., Stockton-on-Tees, and owned by Messrs. Jackson Bros. & Co., of London, had a satisfactory trial trip. The vessel being light, a speed of 11 knots was obtained. She afterwards proceeded to the Tyne to load. She was engined by Messrs. Westgarth, English & Co., with triple-expansion engines of the following sizes:—20 in., 33 in. and 54 in. by 36 in. stroke.

**SHIPBUILDING CONTRACT.**—Messrs. Fleming & Ferguson, Paisley, have received an order from a firm in Sydney for a 1,200-ton steel twin screw steamer. She is to be fitted by the builders with two sets of their patent quadruple expansion engines to indicate 1,200 H.P.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

### THE SPEED OF THE "CITY OF PARIS."

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—Your article in the July issue of the MARINE ENGINEER, commenting on the speed of the *City of Paris*, has given great satisfaction here in the North, and we have had it reproduced in some of the local papers. The reason the services of the chief engineer are invariably ignored lies deeper than at first sight appears. When the transition took place from sail to steam, the captains could not tell what to make of him; he soon found that he could not treat him as a sailor, and his duties, as well as the machinery, were a mystery to him, and he stood somewhat in awe of the seemingly complicated piece of mechanism; this, coupled with the independence the engineers have assumed generally, has no doubt tended to keep alive a feeling of antipathy that should now cease in the interests both of themselves and their owners.

Your kindly reference to Mr. Ernest Gearing, who is well known here, will have a tendency in the right direction. Surely in receiving the praise of his friends on the other side, the captain, if a gentleman, must have known that he was receiving that which deservedly belonged to another, and, to an ordinary mind, must have felt a "little small."

There is no doubt that engineers themselves have a great deal to answer for in the past for the inferior position they hold to-day, but of late years there has been a great influx of well-educated and well-trained young men who have joined the service, and are making their presence felt to the advantage of the profession, and necessarily so, as the boilers and machinery are now of a type that require the highest order of intelligence.

It is a remarkable fact, that with the present system of the management of steamers, there are no duties devolving on masters except the navigation of the vessel, the business at both ends being arranged and done for him, hence the master's position, naturally, has been shorn of much of its prestige, and every day sees more and more the reliance placed on the ignored but necessary engineer.

Indeed, it is a question whether the owner would not be better served if the captain was a trained engineer, learning navigation after his own business—not a very difficult task. The captain would then be a captain indeed. At present he holds by law a most anomalous position; he is responsible for everything on board being conducted in a proper way, although he is, and insists on remaining, entirely ignorant of the simplest piece of mechanism, I suppose as being beneath the notice of a "Commander."

This communication is rather long, but as your paper is the only one printed in the interests of Marine Engineers, perhaps you will kindly insert this and oblige,

Yours truly,  
"SUPER."

Sunderland, July 5th, 1889.

### THE PADDLE STEAMER "KING ORRY."

To the Editor of THE MARINE ENGINEER.

SIR,—My attention has just been called to a paragraph in your issue of the 1st inst. respecting the paddle steamer *King Orry*. Your report states that the speed of the boat, after the new engines were fitted, was about 15½ knots; and in justice to me, the maker of the new engines, I hope you will find space in your paper for the facts relating to the trial trip. The official run was from the Clock Light to Corsewell Point—a very different thing to the measured mile; and soon after starting, one of the piston-rods unfortunately got hot, which entailed the engines running dead slow for 23 minutes; and in spite of this, and without any allowance being made for the detention, the Referee made the speed to be 16.55 knots.

I am, Sir,  
Yours obediently,  
C. J. COPELAND.

### NEWCASTLE MEETING OF THE BRITISH ASSOCIATION.

To the Editor of THE MARINE ENGINEER.

6, Portici Vittorio Emanuele,  
Genoa, July 11th, 1889.

DEAR SIR.—Now that public attention has been directed to the above subject, we hope that the whole question of forced draught and thorough combustion of coal and coal gases will be fully discussed by the brilliant and renowned meeting of practical engineers, chymists, &c., at Newcastle-upon-Tyne, at the coming meeting of the British Association, and that the results will be great improvements in steamboats, steam-marine boilers, &c. The North of England Boat Trade Association are wishful to have the best and most practical suggestions on these now nationally important questions.

Yours very truly,  
GEORGE FAWCETT.

### THE "POLYPHEMUS."

To the Editor of THE MARINE ENGINEER.

SIR,—I am sure many engineers besides myself will have read with pleasure your leader in this month's issue, regarding the beating of the Atlantic record by the s.s. *City of Paris*, but a feeling of injustice is always the result, when we see all the honours heaped on the captain (when a steamer makes a fast passage), instead of on the engineering staff, as it should be. This, I am glad to see, you have taken up in the same light as many other practical engineers. If Captain Watkins steered a straight course on this particular voyage, making the passage in 5 days 23 hours, I fail to see how he can in the least add to the reducing the time to 5 days 12 hours, unless the engineers of the *City of Paris* drive the ship to do it. Mr. Gearing and his staff certainly deserve the whole credit (much more so than the captain) of being the means of driving their ship across the Atlantic as was done.

There is yet another Captain v. Engineer matter which I think ought to have some explanation. The *Daily News* Naples correspondent writes about the middle of June last that the captain of the British torpedo ram *Polyphemus*, sent for a number of Italian workmen to clean the engines, and they removed, in fact stole, a lot of brass and steel screws, which holds the machinery together, and thus crippled the ship that she could not leave the port, and it was only after the theft had been done that the engineers became aware of it, and hurried on deck to inform the captain. He at once applied to the Italian authorities, who arrested 32 of these workmen. Perhaps some of your many readers will be able to give some further information, to let outsiders know why the captain had to employ outside foreign labour for this purpose. Where were the firemen of the *Polyphemus*? or what were they doing that they (as is customary) could not clean the engines? What would the engineers of the *Polyphemus* be doing that the captain had to employ men to clean their engines? and where were they that these foreign workmen could remove, and carry away, screws of such consequence as to practically disable the ship without their being seen?

By kindly inserting this letter in your valuable paper, probably some of your numerous readers will be able to explain away this ugly report,

Yours, respectfully,  
ENGINEER.

Leith, July 19th, 1889.

MESSRS. ALLEY & MACLELLAN, of Sentinal Engine Works, Glasgow, have recently secured the contract for a set of twin-screw triple-expansion engines for a vessel building in England. This makes the sixteenth marine engine order received by this enterprising firm within nine months, and their works are at present very busily occupied with these and other commissions.

For Messrs. A. Dom Bordes, of Dunkirk, who already own a number of the largest sailing vessels afloat, Messrs. Russel & Co., Port Glasgow, have contracted to build a steel sailing ship which, when finished, will be in all respects the largest sailing vessel in the world. She is to be 357 ft. in length, rigged with five masts, and her Customs' measurement will amount to 3,700 tons.

**Recent applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, from June 15th to July 17th, 1889.**

- 9980 Cuthbert Gardner, 16, Finkle Street, Stockton-on-Tees. Safes for carrying mails.
- 9986 J. Stewart, T. Charlton & J. Casey, 8, Quality Court, London. Tanks used for storage of petroleum.
- 10033 J. Cochran & W. Cameron, Grahamston Foundry, Birkenhead. Triple expansion gear of steam or other fluid pressure engines.
- 10058 D. Dixon, 166, Fleet Street, London. Corrugated flues for boilers.
- 10097 F. G. Harvey, 2, South Street, Finsbury, London. Propelling ships.
- 10105 W. Chambers, Southampton Buildings. Steam generators.
- 10119 R. Gwinnett, 14, Cartland Road, Sparkbrook, Birmingham. Driving ship logs.
- 10123 W. Hutchinson, 15, Kirkham Street, Weaste, Salford. Screw or propeller shafts in steamships.
- 10182 A. B. Brown, 87, St. Vincent Street, Glasgow. Steering machinery.
- 10148 W. H. Russell, c/o A. Harvey, P.O. Box 1071, Ottawa, Canada. Freight elevating and transporting apparatus.
- 10152 A. G. Froud & H. F. Holt, 34, Southampton Buildings, London. Propelling ships.
- 10181 F. Anstey & E. J. Houlst, 8, Quality Court, London. Ship lamps.
- 10252 N. C. Parascho, 18, Air Street, Regent Street, London. Ventilating apparatus.
- 10260 W. J. Griffiths, 22, Annandale Road, Greenwich. Propelling canal boats or other vessels.
- 10309 H. Williams, Gowan Brae, Crosshill, Glasgow. Producing draught in furnaces and ventilating.
- 10388 J. Batty, 8, Quality Court, London. Saving life apparatus.
- 10392 H. J. Haddon, 18, Buckingham Street, Strand, London. Burning of liquid fuel in boiler furnaces.
- 10410 Sir W. Thomson, 154, St. Vincent Street, Glasgow. Mariners' compass.
- 10429 W. Thomson, 62, St. Vincent Street, Glasgow. Steering gear and obtaining power.
- 10487 J. Broadfoot, 87, St. Vincent Street, Glasgow. Ships' side scuttles.
- 10497 J. H. Hayman, 32, Northway Road, Coldharbour Lane, Camberwell. Boats or navigable vessels.
- 10586 H. Dunsmuir, 62, St. Vincent Street, Glasgow. Arrangement of multiple expansion-engines for screw propulsion.
- 10592 J. Oldershaw, Eastwood. Nottinghamshire. Compounds for the removal of incrustation in steam boilers.
- 10595 J. W. Macfarlane, 16, Queen's Crescent, Cathcart, Glasgow. Water-tube steam boilers.
- 10665 H. Dunsmuir. Multiple expansion engines for screw propulsion.
- 10745 A. J. Holbrook. Transporting boats overland.
- 10791 A. Hunnable. Propelling boats.
- 10817 C. Simkin. Screw propellers.
- 10820 A. J. Boulst. Safety boats.
- 10856 R. Bell. Marine propulsion.
- 10895 A. F. A. Manier. Transport of ships over land.
- 10918 C. Linde. Thawing of the refrigerating pipes of air refrigerators.
- 10924 E. J. Hill. Convertible deck-seat and life-saving raft.
- 10973 H. Spuhl. Winches.
- 11106 J. S. Baker. Paddle-wheel boats.
- 11182 C. Wells. Marine engines.
- 11169 F. S. Snowden & W. D. Curzon. Hooking on and releasing ships' boats.
- 11184 C. Wells. Steam engine rod ends.
- 11228 J. C. Bowring & A. Newcomb. Hydraulic propulsion of vessels.
- 11284 F. H. Trevithick. Metallic packing for piston rods.
- 11248 J. F. Buston. Propelling ships by steam.

**BOARD OF TRADE EXAMINATIONS.**

NOTE.—1 C, denotes First Class; 2 C, Second Class.

June 22nd, 1889.

Aitken, Jno. K. 1C London  
Anderson, John 2C "  
Child, Jno. Hy. 2C Cardiff  
Elcoat, Jos. .. 2C N. Shields  
Foote, Jas. .. 1C Glasgow  
Jones, John F. 2C Cardiff  
King, Wm. Thos. 1C "  
Keith, David .. 1C Glasgow  
Lennie, Jas. S. 2C "  
Lowson, T. G. 1C "  
Maccall, James 1C "  
Marshall, A. R. G. 2C "  
Nicholl, Edwd. 1C Cardiff  
Saddler, Robt. .. 2C London  
Sinclair, Chas. S. 2C Cardiff  
Thomson, David 2C Glasgow  
Thomson, Jas. .. 1C "  
Thomson, W. G. M. 2C London  
Wotherspoon, J. D. 2C N. Shields

June 29th, 1889.

Bell, C. F. A. .. 2C Hull  
Cox, Stanley .. 2C Falmouth  
Craigie, S. W. .. 2C London  
Duguid, John .. 2C N. Shields  
Findlay, Louis 2C London  
Gray, W. ... 1C N. Shields  
Hall, T. ... 2C "  
Hedley, Percy .. 1C "  
Lambert, Wm. 2C N. Shields  
Lovell, Denis R. 1C Hull  
Luck, John .. 1C "  
McNaught, J. W. 1C London  
Myers, Jos. .. 1C "  
Rayner, F. W. 2C Liverpool  
Robertson, Alex. 2C Sunderl'd  
Sambrook, John 2C Bristol  
Taylor, C. W. A. 1C Aberdeen  
Walenn, F. F. ... 2C London

July 6th, 1889.

Aird, Chas. .. 2C Leith  
Allan, David .. 2C Liverpool  
Bell, Andrew J. 2C Glasgow  
Blow, Wm. .. 2C Cardiff  
Blythe, Donald 2C Leith  
Brooker, Geo. B. 1C London  
Brooksbank, O. E. 2C Liverpool  
Burn, Henry .. 1C "  
Carmichael, P. 2C "  
Coutts, Charles 2C Leith  
Cuthbert, Wm. 1C Glasgow  
Dodd, Britton H. 2C London  
Dulin, Wm. Thos. 2C "  
Earley, F. F. .. 2C Glasgow  
Edwards, Benjn. 2C "  
Edwards, H. B. 2C Liverpool  
Geddis, John .. 2C Leith  
George, T. Gough 1C Cardiff  
Grant, John .. 1C Greenock  
Houston, John J. 1C Liverpool  
Johnson, E. A. 2C "  
Kick, A. Chas. 2C Cardiff  
Killey, Evan W. 1C Liverpool  
Knights, A. G. ... 2C London  
Martin, John .. 1C Cardiff  
McFadyen, Alex. 2C Glasgow  
McMillan, Alex. 1C Greenock

Murdie, Alex. .. 2C Glasgow  
Murray, Chas. ... 1C "  
Pinkerton, W. F. 1C "  
Popkin, John H. 2C Cardiff  
Powrie, Alex. .. 1C Liverpool  
Reynolds, Saml. 2C Greenock  
Ross, Donald .. 2C "  
Scorey, Geo. P. 2C London  
Smail, David .. 1C Leith  
Smith, David .. 1C "  
Smith, J. W. .. 1C Glasgow  
Swan, Jas. .. 1C "  
Walker, Wm. ... 1C "  
Wilkie, Jas. ... 1C "

July 13th, 1889.

Armour, J. G. ... 2C Liverpool  
Ascott, Thos. W. 2C Hull  
Black, P. M. .. 1C London  
Blair, Geo. ... 2C Liverpool  
Blashill, R. R. .. 2C Hull  
Brasier, Chas. ... 2C London  
Chipchase, Wm. 2C "  
Duckitt, Jas. W. 1C Hull  
Foggitt, F. A. .. 2C N. Shields  
Glen, Wm. ... 2C Liverpool  
Grant, Alex. A. 1C Dundee  
Hilton, J. B. .. 2C Liverpool  
Hynd, Alex. ... 2C Dundee  
May, H. H. W. 2C Plymouth  
McPherson, Jno. 2C N. Shields  
Nelson, Henry .. 2C "  
Oliver, John .. 2C Liverpool  
Proctor, John H. 2C London  
Richardson, J. T. 2C N. Shields  
Shaw, Robt. Jno. 2C "  
Wall, H. J. ... 1C London

July 20th, 1889.

Amlot, W. R. ... 2C Liverpool  
Bell, John. H. ... 2C W. Hartpl  
Barrie, Chas. ... 2C Aberdeen  
Corney, D. W. ... 2C N. Shields  
Ellery, Thos. ... 1C London  
Flanagan, Hy. ... 2C Liverpool  
Gear, A. J. ... 1C Cardiff  
Hamilton, W. C. 1C "  
Hewitt, John. W. 2C "  
Johnson, C. P. ... 2C Hull  
Johnson, Peter .. 2C W. H. rptl  
Jones, Wm. R. ... 2C Liverpool  
McPhee, E. ... 1C London  
Marshall, John 1C Glasgow  
Meager, Wm. C. 2C Cardiff  
Matthews, Hy. 2C Liverpool  
Mundy, G. H. ... 2C Hull  
Palmer, John H. 1C N. Shields  
Parry, Jos. ... 2C "  
Pearson, Wm. ... 1C London  
Perrett, Jas. ... 2C Liverpool  
Robson, Geo. ... 1C N. Shields  
Rogers, Jos. G. 1C Liverpool  
Rogers, John J. 1C Cardiff  
Scott, Wm. ... 1C London  
Simons, T. S. ... 2C W. H. rptl  
Tait, George ... 1C Glasgow  
Terrance, Julius 2C Cardiff  
Tough, Alex. ... 2C London  
Walker, J. L. ... 1C "  
Walker, H. E. ... 1C Cardiff

SHIPBUILDING CONTRACT.—Messrs. Fleming & Ferguson, ship-builders and engineers, Paisley, have received an order from Timaree Harbour Board, New Zealand, for a paddle tug, for service on the New Zealand coast. Her machinery will consist of two sets of disconnecting compound diagonal surface condensing engines of 600 H.P.

# The Marine Engineer.

LONDON, SEPTEMBER 1, 1889.

**T**HOUGH it may be doubtful, in the recent Naval Manœuvres, whether much will be learnt from the point of view of actual power of destructiveness embodied in the many different designs of war-ships afloat since their efficiency is barred from actual destructive effect, still it would appear certain that much may be learnt from the engineer's point of view as to the reliability of the engines and mechanisms employed in the Navy. We are sorry to see that manœuvres and efforts of the utmost importance for offence and defence have been marred by breakdowns of both engines and boilers. We think it very probable that a large increase of risk in the breakdown of engines and boilers has been occasioned by the comparatively recent alterations of design and conditions that have been adopted by the Admiralty. It is a common practice now, after the construction of the hull has been effected, and the horse power of the steam-engines and boilers worked out to provide a stipulated speed, to specify a maximum limit of space and weight within which engineers are required to tender to supply engines and boilers to produce the required result. As the pressure is very great upon the Admiralty designers to take the largest proportion of weight that they can get for heavy armour and armaments, there is always a tendency to rob the space and weight that can be allotted to the engines and boilers. In order to meet the requirements of the tender, the engineers and boiler-builders naturally cut down all dimensions they dare to keep within the requirements of the specification, and the excessive power now required for the higher speeds at which it is sought to propel the war-ships of enormous tonnage, has to be supplied by high-pressure steam, which still further increases the normal pressures as formerly used, requiring a more liberal margin in weight and dimensions than hitherto, to give as good a margin of safety as heretofore. It would appear that the many disasters affecting the machinery of our large autumn Fleet, would prove that a sufficient limit of safety has been almost passed. The modern adaptation of working on occasions under forced draught, which is regarded as an abnormal condition, serves seriously to increase the proportionate risks at such periods, which, as they are usually the most critical for the ships, are most marked in their disastrous effect

should a breakdown occur. The breakdown of engines is usually indicated by the serious overheating of bearings, which, as in the case of the *Hercules*, may be sufficiently serious to absolutely retard and throw out of action the Admiral's vessel in an attacking fleet. With regard to boilers, the scanty notices given by the daily papers would seem to imply that the leakage of tubes has formed the chief item of the more serious breakdowns; but any engineer would be able to recognise that a tube leakage that causes death by scalding, or is of sufficient magnitude to necessitate the retirement of the vessel to port, cannot be a question of mere leakage, but is rather of the character of a detailed explosion. The ordinary leakage of tubes is a matter to which all tubular boilers are more or less exposed, and is never regarded as a matter materially interfering with the continued movement of the vessel, but may be either disregarded or readily stopped. These serious defects have probably arisen from the increase of boiler pressure, which is considerable, under normal conditions of draught, and becomes excessively increased under the action of forced draught. Tubes are reduced in thinness and crowded together to give a maximum conduction of heat, and maximum heating-surface in minimum volume. The crowding together of boiler-tubes will require very stiff and rigid boiler-tube plates without possibility of any flexible movement of such plates. The thinness of the tubes will probably cause them to leak without having the power to spring the tube-plates with them in their now excessive expansion and contraction, which will depend upon the average range of temperature at which they are working. There would appear, then, to be but two alternative results from our present experience—either that general dimensions, and weight of boiler and engines, must be increased in relation to power developed by the Admiralty designers, or that the conditions are so altered by the higher temperatures and pressures of working both in boilers and engines that larger proportions of frictional-bearing surfaces, and better designs of boiler-shells and tubes to permit greater flexibility of tubes to shells, to allow for irregularities of expansion and contraction, must be afforded. We are glad to see some evidence that the Admiralty itself is of this opinion, and the simple step has already been taken of greater reliance in the matter of dimensions and strength. We think, however, a good deal might be done by the designing engineers in keeping in view the greater dangers lately intro-

duced on board ship by forced draught used in emergencies, and the accompanying higher pressures and temperatures of working.

THE competition of the passenger-carrying Atlantic liners must surely reach its culmination. We have in years past already seen the production of splendid liners, such as the *Etruria* and the *Britannic*, than which it was difficult to suppose any finer could be produced. The White Star Line, however, have apparently capped these productions by their two new vessels, the *Teutonic* and the *Majestic*, the former of which has made its preliminary run and her first voyage across the Atlantic; the latter vessel will probably not be running until the spring of next year. The *Teutonic* has been visited by the Prince of Wales, the Emperor of Germany, and many other visitors, and much approval has been expressed of the general comfort of her internal arrangements and fittings, whilst unbounded admiration has been given to her magnificent proportions and action as a sea boat. This vessel is of 4,244 tons register, and is enabled to carry 1,300 to 1,400 passengers of all classes, and when fully loaded, 3,000 tons of coal and nearly 4,000 tons of cargo. Her total displacement is not far from 16,000 tons, and in her trip, without pressure and at moderate speed of revolution, indicated from 10,000 to 11,000 H.P. Steam is supplied at 180 lbs. per square inch by 12 boilers with 72 furnaces, and they are fitted to be worked with a modified Howden's system of forced draught, heated air being supplied both above and below the grates by fans. The wind trunks are very conveniently arranged, the supply being drawn through gratings on the flying deck, no cowls being visible from the promenade deck below. The ship on her trial run actually travelled through the water at something over 19 knots with 68 revolutions, and it would appear from the proportions of her screws that this result indicates very little slip. The boilers, we are glad to see, supply readily a superabundance of steam, more than the engines can take at the above speed, so that apparently, as far as regards the available steam power, better results than 19 knots may be readily obtained without forcing or distress. Messrs. Harland & Wolff, the Belfast builders, are much to be complimented upon the beautiful design and efficiency of the engines, which fulfil their duties with the greatest ease, there being no warm bearings or water cooling

necessary during the above run, and there was practically no vibration whatever, and the wake presented the least possible broken water or disturbance. Messrs. Harland & Wolff have had the courage of their convictions upon a much disputed point, and in which we agree theoretically, in omitting steam jacketting altogether from the cylinders, using instead non-conducting lagging and an air jacket. Throughout the whole design of the engines great strength is developed with comparative lightness and elegance of outline. The hull has also been constructed on a system which we believe has not yet been adopted in large Atlantic steamers. To get over the objection to single butt strap joints, which have a tendency to open, the ends of the plates are united by simple lap joints, the most forward plate always lapping over the plate to the sternwards to prevent increase of resistance in passing through the water. Double butt strap joints have been before used for this purpose, but it is considered their projection from the body of the hull adds considerably to the water friction against the sides of the hull. Many of the plates are of unusual dimensions, being 24 ft. long by 3 ft. wide. The hull is cut up into sections by watertight compartments in a way to secure the maximum of safety, and all the doors can be closed from the fly deck by pulling small wire rope lines which release hooks holding the doors up. The doors are also made automatic, so that they will close of themselves if the water rises unduly in the bilges. The engines are in two sets of triple-expansion cylinders, their diameters being 43 in., 68 in., and 110 in. respectively, with a stroke of 60 in. All the cylinders are fitted with piston valves, being arranged vertically in a row side by side. At one part of her trip she ran up to 22 knots an hour, and the bows being of a special construction, were very striking in their clean action of cutting through the head seas with the least possible disturbance of the water. The ship has not been designed so much to attain excessive speed in smooth water, but to maintain a high average speed through heavy head seas. She is made rather full below water at the bows and sharp above, with the object of making her buoyant forward, so that she may not bury herself in a head sea, whilst she is sharp above the water line to reduce the resistance of break-waves. Now, it is the more usual practice to build a ship sharp below and full above, with the idea that she will lift when she gets fairly into the wave, but Messrs. Harland & Wolff believe it to be a better principle to prevent the vessel from burying herself

first and then lift. Thus it is expected she will attain a high average speed in the roughest and worst weather. The interior fittings for the first saloon passengers are most luxurious and comfortable. The saloon and sleeping accommodation have been placed in the very middle of the ship where there is a minimum of movement, there being an awning deck on top of this again which serves as a permanent shelter in place of the canvas now used for this purpose, and on which the boats are placed, so as to leave 18 ft. clear on the promenade deck on each side of the deck-houses. There is an exceptionally luxurious amount of paneling, paintings, moulding and gilding to render the whole a most highly ornamented hotel, while the general lighting is effected by the electric light being introduced into the ornamentation of ceilings in place of the usual hanging lamp. Another striking point of the *Teutonic* is that she has been built in accordance with the views of Mr. White and the Admiralty requirements for conversion into an armed cruiser. She now carries four 36-pounder quick-firing Armstrong guns, with trained men to work them, and she can mount in a very short time eight similar guns in addition. The engines are nearly below the water line, and coal armour can be carried to protect a small portion above that level. The rudder is so constructed that she can be made to steer with the lower half alone if the top were injured. The *Teutonic* thus would seem to be as valuable an addition to our War Fleet in time of emergency as she undoubtedly is to our passenger traffic across the Atlantic.

THE obnoxious clauses in Welsh charter parties are continually being complained about by steamship owners, and it is small wonder that such should be the case. The chief cause for surprise is that they have been put up with for so long; but that peculiar "something" which prevents shipowners combining for securing common ends, is at the root of this continuance, as it is at the root of other abuses connected with the shipping trade. Oddly enough, one seldom hears complaints about Welsh charters generally. They appear to be gone through clause by clause. Thus, at one time we hear complaints as to "dispatch money," at another of the bunkering clause, and so on. With regard to dispatch money it is to be said that there may be some excuse for the system. "Time is money," and a vessel's being loaded in five or six hours under the time given in the charter, may

naturally be looked upon as worth the few pounds charged by the shipper for effecting this saving; but a system has become general of stipulating for more hours than are really required for loading, with the express intention of making dispatch money. This, of course, should not be. A shipper should be given only hours enough to enable him to load a vessel without any undue risk of detention. If he manages to get the loading finished a few hours sooner than he expected, then it is only right that shipowners should pay for the advantage. But when we find an abnormal amount of dispatch money being earned, the custom becomes a disgraceful abuse. It is only fair to the Welsh coal-shippers to say that they are not the only sinners in this direction; the merchants in the ore trade are, if anything, worse than the coal men.

BAD as excessive dispatch money may be, there is another system a thousand times worse, and that is the bunkering clause. Why should a shipowner not only be bound to take his bunker coal from the man to whom he lets his ships, but have, in addition, to pay a high price for an inferior article? At the present moment, for example, owners are paying charterers 13s. 6d. per ton net for coal not worth more than 10s. 6d. or 11s. less 2½d., and there are cases enough in which the coal supplied is worth even less than this. What is the result? The vessel not only has to pay too dear for her bunks, but her passages are lengthened, and her safety often enough endangered. We are surprised that this system has not, before now, caused censure at Wreck Enquiries, but at these enquiries more attention appears to be paid to scientific reasons for this or that disaster than to common every-day customs at loading ports. There are certainly cases in which shippers are content with a less exorbitant profit, and supply something like a decent bunker coal; but we very much fear they are in a great minority. As a matter of fact, we know some Welsh shippers who do not profess to make a profit out of a cargo as merchants, they live upon fleecing the shipowner. They plunder him in dispatch money, in bunkers at home and abroad, in short weight, in commission, until an owner can well be excused asking himself if he is doing with veritable English merchants, or polite freebooters. That these abuses exist is pretty well known. The sole cause for surprise is that shipowners have stood them for so long. Why cannot a charter party be a simple contract by which :

owner, in consideration of being paid a certain rate per ton, agrees to carry the shipper's coal to its destination? Is there any reason in the world why the shipper should not make his profit out of his buyer, and not out of the shipowner? Does the shipper dictate to the railway company which carries his coal from the pit to the dock that it shall buy all its oil and grease from one firm; its coal from another? Such a thing is never dreamt of. Why then should any other course be pursued in the carriage of coal from the dock to the buyers' wharves abroad? Simply because the shipowner is a sort of invertebrate animal who calls out to the shippers, "Here I am. Come and jump upon me! Put your hand in my pocket! Do as you like with me. Only pay me your current rate for these privileges, and I shall be satisfied!"

## THE CORROSION AND FOULING OF STEEL AND IRON SHIPS.\*

By Professor V. B. LEWES, F.C.S., F.I.C., Royal Naval College.

*Continued from page 143.*

IN the fifth class of protectives we have cement coatings; but these, together with such schemes as the covering the hull of the vessel with vitreous glazes, glass, &c., have of late years, as far as I know, entirely been abandoned. The action of cement on iron, however, must later on be discussed in its important bearing on the protection of the interior portions of the hull, for which it is largely employed, its weight and the difficulty of attachment rendering it unfitted for outside work.

In selecting a protective composition for the bottom of a vessel, one of the second or fourth class should be chosen, attention being given to the points I have indicated, which are that in the bituminous and asphaltic compositions all the original acids must be eliminated, and that in the varnishes of the fourth group quickly evaporating solvents should be avoided, and, if possible, zinc substituted for oxide of iron.

The vessels should have her plates as dry as possible during the application of the protective, and, if feasible, days on which the air is fairly dry should be chosen. The protective should not be too thick, as, if it is, it does not readily fill into inequalities in the plates; and, if in this way any air is enclosed, change of temperature will cause it to expand or contract, thus causing a blister to form, which will fill with sea water and set up rapid corrosion. The composition must either be elastic or else have the same rate of expansion and contraction as the iron; for, if not, the change of temperature will cause cracking and tearing of the composition, with disastrous results. The vessel, if she has to be scraped down to the bare metal, must be scrubbed free from all traces of rust, and where a well-adhering coating of composition exists, it should be painted over and not disturbed. In the case of a new ship, she must be pickled with dilute acid, to get rid of every trace of mill scale, and then washed down with some slightly alkaline liquid to neutralise every trace of acidity, the alkali in turn being removed by clean water. Under these conditions, and given a composition with good adhering properties, but little apprehension need be felt as to the ravages of corrosion on the metal of a ship's bottom, the chief risk being from abrasion and other mechanical injury to the composition, coupled with improper constituents in the anti-fouling compositions. The protection of the interior portion of the vessel, where the plates are exposed to the corroding action of bilge water, rendered more active by a high temperature, leakage from cargo, acids and sulphates from

wet coals, and the presence of such electro-negative factors as coal dust, scale, and rust, is a matter of quite as great importance as the exterior protection; whilst the great chance of mechanical abrasion during coaling and shifting of cargo, as well as the difficulty of getting at the lower portions of the hold to examine the condition of the plates, renders it a question of the gravest consideration. The corrosion found in the portions underneath the engine-seats, the bunkers, and the water-ballast chambers, especially near the engine-room, is often very serious, and needs most careful watching, which, from the position of these parts of the vessel, it is very hard to bestow upon it.

It must also be remembered that the bilge water in a vessel is in constant motion, and that the air in these parts of the vessel may be expected to be exceptionally rich in carbonic acid gas, which, as I have before shown, is the most important factor in corrosion. Under these conditions, any abraded portion would probably be continually washed over, and then exposed to the foul air, a condition of things most conducive to rapid rusting. Here are three main classes of protectives for the interior of a ship:—

- (1) Cements.
- (2) Bituminous coatings.
- (3) Paints.

The first of these, the cement coatings, have many good points to recommend them, but they also have many serious drawbacks.

The rigidity, firmness of adherence and endurance, are all of them points of the greatest importance, and there is no doubt but that the silicates present in the cement in time not only bind the cement into a mass of wonderful hardness, but also bind the cement to the iron. A point to which I should like to draw your attention, however, is that a thin coating of Portland cement is highly porous, and that it can be permeated by liquids and gases. Suppose, now, that some copper scale from the interior fittings had fallen into the bottom of the vessel, and had been converted into soluble oxychloride of copper by the saline bilge water, this solution would soak through the capillary orifices in the cement, until it came in contact with the iron below, when the copper would be deposited on the iron, and rapid galvanic action set up, the cement being loosened, and to a certain extent lifted, by the formation of rust, whilst corrosion would gradually extend under the cement, giving on the outside of the coating but little sign of the damage taking place below it.

Also the hardness and rigidity of the cement gives it a tendency to crack away from the metal when any strain is thrown on the plates, or during any expansion or contraction of the metal; whilst any repairs on the outside of the ship, such as making a boring to test the thickness of plate, replacement of rivets, &c., would undoubtedly cause a loosening of the cement coating within, and, wherever a loosening takes place, the space between the cement and the plate will quickly be found to become a starting-point for corrosion, which quickly spreads and loosens the cement, and will only be discovered by chance.

It is for this reason that I consider bituminous or asphaltic varnishes, freed from any trace of acid, and applied hot, or sound, tough paint, preferable to cement; as, although they are not so hard, yet if serious corrosion should be set up, it is easily discovered and stopped before much damage results, whilst, being impervious to moisture, deleterious solutions, either from the coal bunkers or cargo, would be prevented from acting upon the skin of the ship.

In approaching the subject of fouling, one is impressed with the apparent hopelessness of obtaining any reliable information from the successes or failures registered by the bottoms of the vessels in the Service, or in the Mercantile Marine. Hundreds of ships may be examined, and their condition and the nature of the compositions used upon them registered, and just as one begins to feel that the key to the mystery is within one's grasp, a whole series of results so abnormal suddenly comes to light that it seems impossible to reconcile them with one's previous experience. A ship may sail half-a-dozen times to the same waters, coated with the same composition—on four occasions she will come home clean, and in good condition, whilst on the other two voyages she may accumulate an amount of weed and animal life sufficient to knock down her speed from nine knots to five. Moreover, if the compositions with which she was coated be examined, and scrapings taken from her on her return, no cause will present itself that can in any way explain the great difference in her condition. After several years' close observation, however, certain factors begin to make themselves apparent. Ships at sea from March to August show a worse-

average than those afloat from August to March; one also begins to realise that the amount of fouling increases enormously if the ship has long been at anchor—ships which have been lying at the mouths of rivers, although quite clean in the brackish water, foul much more rapidly on going to sea than vessels which have been cruising, or even at anchor for the same time, in salt water; and, finally, certain ports and certain seas seem to exercise a deleterious effect both as regards corrosion and fouling, which is not to be found elsewhere.

Turning back to the naval history of the past, we find that fouling is no new trouble born with the advent of our present iron monsters; but that it has been the one trouble that the combined engineering and scientific skill of many centuries has been unable to overcome.

With our wooden ships, metallic copper sheathing, if it were of the best kind, answered the purpose fairly well; but then the copper wasted so fast that inferior kinds and alloys were substituted to prevent the rapid loss, and, with the slowing down of the destruction of the copper, at once the trouble of fouling returned.

When iron ships began to replace the wooden ones, as was only natural, attempts were made to utilise the metal which had before given relief; but it was quickly found that the effect of the galvanic action set up by the copper was fatal to the iron plates of the ship, and attempts were then made to sheathe the ship with copper plates in such a way that they should be insulated from the iron of the vessel, but this was found to be practically impossible, and the use of copper sheathing has been totally abandoned for the last forty years. Early in the history of iron shipbuilding the idea was started of using coatings of paint, so prepared as to fulfil the same functions as the copper plates had done; but from 1840, when the first paint of this kind was patented, down to the present day, when there are upwards of thirty-two different compositions in the market, very little progress has been made in their manufacture, and the best of the present compounds cannot be relied upon for keeping a ship's bottom even fairly free from fouling for periods extending over nine months, and I am personally convinced that the reason of this is to be found in the fact that a start was originally made in a wrong direction, and that the anti-fouling manufacturers have been following each other like a flock of sheep ever since.

The idea which originally led to the present class of anti-fouling compositions was that the copper salts formed by the action of the sea water on the metallic sheathing owed a considerable portion of their value as anti-foulers to the poisonous action they exerted upon marine animal and vegetable growths; but, when an observer comes to study the natural history of these lower forms of animal life and vegetation, it is gradually forced upon one that it is only in the early stages of their growth—the germ period—that metallic poisons can effect them. Seaweeds do not take in the constituents they require for their growth by means of their roots, as is, to a certain extent, the case with ordinary plants, but absorb them by means of their pores from the water itself, the root only serving to attach them to the solid they choose for their resting-place; and it is also well known that when once a marine plant which has passed the first stages of existence is dislodged or torn from its support, it cannot re-attach itself to anything else, whilst most of the mineral poisons have little or no effect upon their life and growth.

In the same way we find that, with the animal life found on a ship's bottom, the under side is used to cling on with only, and not as an extractor of nourishment, and that, therefore, after the seeds and germs have once obtained a foothold on the side of the vessel, no amount of poison which can be put into a composition will have any effect upon them. Metallic poisons undoubtedly do exert an influence upon the germs in their earliest stages; but after that they are perfectly useless as anti-foulers, and only imperil the plates of the vessel.

The germs of both kinds of growth are of necessity more abundant in the surface water near shore than in deep water, and therefore the period when the ship is in port is the very time when the germs are most likely to make good their attachment, after which their further development is, unless other methods of getting rid of them are employed, merely a matter of time.

On examining the conditions under which a vessel is placed when coated with a composition which relies for its anti-fouling powers on metallic poisons only, we at once see the reasons which must make such a coating of little or no avail. In the composition we have drastic mineral poisons, probably salts of copper, mercury, or arsenic, which have been worked into a

paint by admixture with varnishes of varying composition, and each particle of poison is protected from the action of the sea water by being entirely coated by this vehicle; that this must be so is evident, or the composition would not have sufficient cohesive power to stick on the ship. As a rule, care is taken to select fairly good varnishes, which will resist the action of sea water for, perhaps, two or three months, before they get sufficiently disintegrated to allow the sea water to dissolve any of the poison; whilst, even with the accidental or intentional use of inferior varnishes, three or four weeks will pass before any solution can take place, and any poison be liberated to attack the germs. A ship is dry docked, cleaned, and, her anti-fouling composition having been put on, she goes probably into the basin to take in cargo. Here she is at rest, and, with no skin friction or other disturbing causes to prevent it, a slimy deposit of dirt from the water takes place, and this, as a rule, is rich in the ova and germs of all kinds of growth, whilst the poisons in her coating are locked up in their restraining varnish, and are rendered inactive at the only period during which they could be of any use. After a more or less protracted period, the ship puts to sea, and, the perishing of the varnish being aided by the friction of the water, the poisonous salts begin to dissolve or wash out of the composition; but the germs have already got a foothold, and with a vessel sweeping at a rate of, say 10 to 12 knots through the water, the amount of poison which can come in contact with their breathing and absorbing organs is evidently so infinitesimally minute that it would be impossible to imagine it having any effect whatever upon their growth. If the poison is soluble, it is at once washed away as it dissolves; if it is insoluble, then it is also washed away, but there is just a chance that a grain or two may become entangled in the organs of some of the forms of life, and cause them discomfort. As the surface varnish perishes, the impact of the water during the rapid passage of the vessel through the water quickly dissolves out or washes out the poisonous salts, and leaves a perished and porous, but still cohesive, coating of resinous matter, which forms an admirable lodgment for anything which can cling to it; and by the time the vessel lays-to in foreign waters, teeming with every kind of life, the poison which would now again have been of some use is probably all washed away, and a fresh crop of germs are acquired, to be developed on the homeward voyage, and a "bad ship" is reported by the person who looks after her docking. It is evident that a poison, even if it had the power of killing animal and vegetable life in all stages, could only act with the vessel at rest, unless it were of so actively corrosive a nature as to burn off the roots and attachments of the life rooted to it, and if it did this, what, may I ask, would become of the protective composition and the plates of the vessel? And I think it is also evident that any poison so used must be under conditions in which it is very unlikely to be in a position to act when it might do good.

The lamentable failure of composition after composition of this kind has gradually reduced them in number to some ten or twelve at the present time, and in most cases it is low price alone which keeps them in the market.

The practical proof, given by experience, that poisons alone are unable to secure a clean bottom soon led many inquirers to the conviction that it was the exfoliation in the case of copper which had acted in giving fairly good results, and in many compositions the attempt has been made to provide a coating which shall slowly wash off, and by losing its original surface, shall at the same time clear away germs and partly developed growths, and so expose a continually renewed surface, in this way keeping the bottom of the vessel free from life. There is no doubt that, when this is successfully done, a most valuable composition will result, but the practical difficulties which beset this class of anti-foulers must not be overlooked. In order to secure success, the composition must waste at a fairly uniform rate, when the ship is at rest, and also when she is rushing through the water; and this is the more important in the case of service vessels, as in many cases they spend a large percentage of their existence at anchor, or in the basins of our big dockyards. If a composition is made to waste so rapidly that it will keep a vessel clean for months in a basin, then you have a good composition for that purpose; but send the vessel to sea, and under conditions where you have a higher temperature of water, and the enormous friction caused by her passage through the water exerting its influence upon the composition, and you will find that the coating, which did its work well for six months at rest in the basin, will, in the course of one month under these altered conditions, be all washed away, and

fouling will be set up. Noting this result, the manufacturer renders his composition more insoluble—less wasting—and so obtains a coating which, when the vessel is in motion, scales just fast enough to prevent fouling, and good results at once follow; the composition is then put on the same or other vessels, and they take a spell of rest in the basin, and bereft of the aid of the higher temperatures, and the friction of the water, the composition ceases to waste fast enough, and bad results at once have to be recorded.

There is no doubt that this is the true explanation of the wide discrepancies which are found between the compositions in the Navy and in the Mercantile Marine—take any of the big lines, their steamers are running at a fairly uniform rate of speed, and the periods of inaction are as short as the desire not to waste the charge on the capital they represent can make them, and under these conditions, by varying the constituents in the varnishes used for anti-fouling purposes, it is fairly easy, given the necessary data, to so constitute a composition as to secure admirable results; but when you come to apply this same coating to an ironclad, running at various speeds, and as often at rest as in motion, then you at once find that the composition you before imagined to be all that could be desired fails just as lamentably as the tribe of anti-foulers which preceded it. It is not so very long ago that I had the honour to serve on an Admiralty Committee under the able guidance of Admiral Colomb, and after inspecting many vessels in the Mercantile Marine, and watching all the dockings of service vessels over a considerable space of time, we were forced to the conviction that it was only in very rare cases that the condition of the bottoms of Her Majesty's ships at all approached the freedom from fouling to be found in the ships belonging to the big companies, with the result that some of the most successful of the compositions in the Mercantile Marine were brought into use in the Navy, and I believe the reports of the dockings since they have been adopted will amply prove the existences of the difficulties I have mentioned.

Another factor which is often overlooked, and which tends to give misleading results, is the action of brackish water, which, in many cases, seems to exert a special action in keeping the bottom of a vessel clean, the fresh water having a tendency to disagree with certain forms of marine growth, whilst the salt water is apparently equally unpalatable to the fresh-water forms of fouling.

In most of the compositions now in use, attempts are made to combine strongly poisonous substances with exfoliating and wasting coatings, and this is done by either using metallic soaps, the basis of which is, as a rule, copper, or else by charging a perishable and easily washed-off varnish with poisonous salts, consisting as usual of compounds of either copper, mercury, or arsenic, and in some cases all three.

As I have before pointed out, I do not think the presence of these substances exerts any deterrent action upon the fouling save perhaps when the vessel is at rest; but they exert undoubtedly an important influence upon the rate of exfoliation, as when the perishing of the varnish exposes them they dissolve, or are washed out, and in this way tend to disintegrate and clear away the surface more rapidly, an important and decidedly useful function, but one which might be more cheaply performed by substances other than high-priced metallic poisons.

The use of metallic poisons of the character indicated throws an increased burden upon the protective composition, as, should the latter become abraded by friction of chain cables, barges alongside, or any other cause, the iron of the vessel will be attacked by the metallic salts, either present in the soluble form in the anti-fouling composition, or rendered so by the solvent action of the saline constituents of the sea water, the action of the metallic salts being to rapidly dissolve portions of the iron, and to deposit the metal which they contain upon the surface of the plates, and these deposits, exciting energetic galvanic action, cause corrosion and pitting to go on with alarming rapidity. Both mercury and copper salts are offenders in this way, but copper is by far the most objectionable, from the fact that the salts formed by the action of the sea water upon the compounds used in the compositions are far more soluble than the corresponding salts of mercury, and are, therefore, liable to be present in much larger quantity, and so exert comparatively a much more injurious action on the plates.

As an illustration of this, two equal portions of sea water were saturated, the one with copper chloride, the other with mercuric chloride, and into each a piece of steel, planed upon one side, and of about equal weight and size, was placed, and left for four days. At the end of this period the two plates were

removed, and after being cleaned and dried were again weighed, when it was found that the one exposed to the copper saturated sea water had lost 22.2 per cent. in weight, while the plate exposed to the mercurial solution had only lost 3.6 per cent., this being due to the much larger amount of the copper salt soluble in the sea water.

On now placing these plates in clean sea water, corrosion went on in each case with extreme rapidity, and after being exposed for a month they had both wasted to about the same extent, that is to say, when once deposited on the iron, mercury is practically as injurious as copper.

I am quite aware that this experiment is not at all likely to be carried out in practice, and none can have a greater conviction of the inutility of small laboratory experiments than I have, as they lack all the factors of mass of material and atmospheric influence which play so important a part in a question like the present; but such an experiment gives one a definite and fairly correct idea of the relative rate of action of the two poisons upon the plates.

All the time the ship is in motion, the wash of the sea water will prevent the metallic poisons doing the plates or the marine growths much harm, but there is one phase of this question which I think has been overlooked. I need not point out that in certain ports there is a fashion in compositions, and that most of the homes of the Mercantile Marine have some pet local composition which is largely used at the particular port. If, now, many ships are laying in a basin, taking in and discharging cargo, and if the prevalent compositions contain copper, it is evident that a certain quantity will go into solution in the water, which often does not undergo frequent or rapid change, and under these conditions every ship in the basin will be exposed to the same danger, and wherever an abrasion has taken place in the protectives, there copper will be deposited on the iron, causing corrosion and destruction of the plates; and it must be remembered that when the vessel is next docked and coated no amount of scraping will remove the fine particles of copper deposited in the pitted and corroded portions of the plate, and so finely divided as to be invisible to the eye, but that it will remain and carry on its destructive work under the new coatings of protective.

It is, I think, a well-recognised fact that, when a vessel coated with a copper compound has become corroded from failure of her protective, or from abrasion, even an entire change of composition does little or no good in stemming the tide of corrosion, until after some considerable period has elapsed, a result which is due to the same cause; and, inasmuch as copper compositions are a source of danger, not only to the ships coated with them, but to any others which may be at rest in the same basin, I do strongly urge upon the manufacturers to abandon the use of these deleterious compounds, and to use others equally efficacious and free from the grave objections I have enumerated.

At the present time, 15 out of the 32 principal compositions rely upon copper in some form or other as the basis of their anti-fouling composition, and in one which has enjoyed considerable favour, finely divided metallic copper itself is used, and should a vessel coated with it, after the varnishes had commenced to disintegrate, be moored alongside an iron ship by a chain cable, or even by a wet hawser, a big galvanic couple would be formed at the expense of serious damage to any exposed iron.

In the history of anti-fouling many attempts have been made to obtain highly glazed and glass-like surfaces which it was hoped would withstand the action of sea water, and afford no lodgment to marine growths; but even glass itself is slowly acted upon by sea water, and, when once roughened on the surface, will foul, whilst the rigidity of such coatings, and the straining and cracking consequent on unequal expansion and contraction of the plates and their coating, offers a serious obstacle to any such scheme.

In concluding this very long paper, I wish to point out that in the present phase of the anti-fouling question, and until some new principle for preventing marine growth has been advanced and successfully adopted, satisfactory results can only be insured by an intelligent use of the existing compositions.

The protective composition is the important composition, and care must be taken to obtain the best in the market, as, if the protection is good, the plates remain uninjured even if fouling take place. The anti-fouling composition to be used with it must either be elastic, or have the same rate of contraction and expansion as the protective, and must—at any rate in the Navy—be chosen to suit the work to be done, such as contain

copper compounds being carefully rejected, whilst preference should be given to those which rely on exfoliation rather than mineral poisons. If a vessel is to remain at rest for a considerable period, an anti-fouling composition which exfoliates rapidly, and which also contains poisons known to act on germ life, must be used, the amount of such poison depending on the seasons and the waters in which the ship is to be; whilst if a vessel is to be continually running, then a slowly exfoliating composition must be employed, and a very small percentage of poison is all that is required, as skin friction and the comparative absence of the germs and spores in deep water will do the rest.

Our ships represent an enormous capital, and any trouble or care which will prolong their existence is well worth taking and will be amply repaid, and at the present time a heavily corroded and foul vessel means either ignorance or negligence on the part of those who have the responsibility of deciding on the compositions to be used, and, finally, it must be clearly borne in mind that there is no anti-fouling composition which ever has been made, or probably ever will be made, that will answer for all cases, and that until this is clearly recognised, the present unsatisfactory condition of the question will exist.

### PASSENGER STEAMSHIPS OF BRITISH RAILWAY COMPANIES.

THE steamship service of the Great Eastern Railway Co. between Harwich and Antwerp, and Harwich and Rotterdam, is highly commendable, and far surpasses the expectation of those passengers to whom a good description of such has been given before embarking in them. The fleet of

the company consists of the following nine ships, the first-mentioned five of which are twin-screw, and the latter paddle steamers.

The *Colchester* and *Cambridge* are sub-divided by five water-tight transverse bulkheads, running up to the main deck.

The engines have very long connecting-rods, 8 ft. centres, and are vertical inclined compound surface-condensing inverted. The whole of the shafting is of steel. The circulating pump is separate from the main engines. The propellers are four-bladed, and of steel. The blades are loose, 11 ft. 6 in. in diameter, and 19 ft. 9 in. pitch.

Each steamer has two double-ended iron boilers, and twelve wrought-iron furnaces, fitted with "Bowling" hoops. The working pressure is 90 lbs. Each of the boilers is 13 ft. in diameter, and 18 ft. 3 in. in length. The diameter of the furnaces is 3 ft. 4 in., and their length 7 ft. The bunker capacity of these steamers is superabundant for the service for which they are used.

The electric light machinery consists of a Shank's "Caledonian Horizontal Engine," of slow speed, and a Phoenix dynamo, running about 600 revolutions per minute. There are 160 electric lights in each ship, including two deck clusters, ten in each, and which represent 200 candle power in each cluster. These steamers are respectively provided with four large steam winches, steam steering-gear, steam windlass, the electric light and electric bells throughout.

The *Colchester* and the *Cambridge* only substantially differ from the *Norwich* and *Ipswich* as regards their length and the material in the construction of their hulls, those of the two former steamers being of steel, and the two latter of wrought iron. These four steamers can be propelled at from 14½ to 15 knots, and their consumption of fuel is economical.

They have each a promenade deck extending their whole length, three-parts of which, from the stern, are reserved for first, and the remainder for second-class passengers.

Name of Steamer.	Length Feet.	Brdth Feet.	Depth Feet.	Ton-nage.	When Built.	By whom.	Engines.	Indicated H.P.	By whom made.	Licensed Passengers to carry.	Sleeping Accommodation.	
											1st Class.	2nd Class.
Colchester	280.8	31	15.2	1159	1888	{ Earles' Co., Limited, Hull. }	{ 4 Cy. 30" and 57"-36 }	2,350	{ Earles' Co., Limited, Hull. }	725	168	75
Cambridge	280.5	do.	15.2	1159	1887	do.	do.	2,200	do.	737	do.	do.
Norwich	260.	31.4	15.	1036	1883	do.	do.	2,000	do.	440	107	64
Ipswich	260	31.3	do.	1036	do.	do.	do.	do.	do.	do.	do.	do.
Peterboro'	215.1	27.	17.6	822	1887	{ Simpson and Co., London. }	{ 4 Cy. 22" and 44"-27 }	1,400	do.	333	60	40
Adelaide	254.2	32.3	13	927	1880	{ Barrow Steamship Building Co. }	{ 2 Cy. 45" and 87"-72 "	2,000	{ Barrow Steamship Building Co. }	682	112	53
Lady Tyler	261	30.2	13.8	950	do.	{ T.&W. Smith North Shields }	{ 6 Cy. (2) 33" and (4) 44"-60 "	1,400	{ Smith, Newcastle. }	700	127	40
Princess of Wales	265.5	30.4	14.2	1049	1878	{ London and Glasgow Shipbuilding Co., Glasgow }	{ 2 Cy. 66" -84 "	2,500	{ London and Glasgow Engineering Company. }	579	111	77
Claud Hamilton	251.6	30.2	13.7	922	1875	{ J. Elder and Co., Glasgow }	{ 2 Cy. 54" and 95"-63 "	2,000	{ J. Elder and Co., Glasgow. }	558	138	98

There are several private cabins on the first-class part of this deck, which are luxuriously furnished. Each has two port-holes and an electric light globe lamp, and the best lavatory accommodation. These cabins are heated with protected steam pipes under the doorway. Extra charges are made for their use according to the number requiring them. There is also on this portion of the deck an elegantly-fitted and ornamented smoking-room, and a very comfortable captain's cabin. The smoking-room is on the aft part of the upper deck. Its sides and ceiling

are tastefully decorated. There are leather covered seats at either side of a table. It is lighted and ventilated by four port-holes, while at night it is illuminated by the electric lights in two globe lamps.

The first-class saloon, which occupies the whole width of the ship, is a very spacious room, and is very luxuriously ornamented and furnished. Its sides and ends are panelled in satinwood, maple and oak, while they are further ornamented by Corinthian pillars with capitals of carved oak relieved with

gold. The ceiling is of very light green, relieved with gold. The saloon is lighted by day partly by a large skylight, of white embossed glass in the centre, and partly by port-holes at the sides. At night the room is brilliantly illuminated by more than a dozen opal globe cluster-light lamps, one or more of which can be turned off at will. Fine ornamental oil-lamps have also been provided for use in the event of the sudden discontinuance by accident of the electric light. On either side of the saloon there are four tables for refreshment, and which can be lengthened when required. There are fixed glass trays over each. On the outer sides of these tables, and adjoining each side of the saloon, there is a continuous settee, while at the inner side of the tables there are fixed revolving oaken chairs, which, as well as the settees, are upholstered in rich figured brown velvet. The port-holes are draped with green damask blinds, fringed with gold, and the floor is covered with a superior Brussels carpet. In the middle of the saloon there is a nice centre-piece, surmounted with transparent plate-glass, which gives light to the sleeping cabins and the passages leading to them below. Several ornamental flowers and plants are placed in the glass covering, and also in the cross-beams above immediately under the skylight. On either side of this centre-piece there are luxurious couches, upholstered similarly to the settees. There is a small carving table close to the steward's bar, near to the entrance to the saloon.

Great attention has been given to the ventilation of this sumptuous apartment. In addition to the general ventilation of steamship saloons from port-holes, a skylight, and small perforated openings above the port-holes, the saloons of the *Colchester*, *Cambridge*, *Norwich*, and *Ipswich* are ventilated by means of upcast shafts from the vestibule or passage leading to the saloons. These shafts are surmounted with excellent fixed (Gibbs) ventilators, which are very efficient in the abstraction of vitiated air from the saloons, and the prevention of down draughts thereto. The ventilation by the perforated apertures close to the ceiling at the sides of the saloons is effected by means of swan-necked openings at the sides of the upper deck. The saloons are warmed by steam pipes covered by perforated metallic casing under the settees.

There is a ladies' boudoir adjacent to the first-class saloon on the main deck, elegantly decorated and furnished. Sleeping cabins are provided for them communicating with this room. Some of these cabins have four and some six berths. There is good lavatory accommodation connected with them.

The gentlemen's cabins for first-class passengers, just below the first-class saloon, are very comfortable sleeping compartments. Some of them are two and some four-berthed. They are approached by short passages, which add to their privacy and comfort. Both the cabins and passages are well carpeted. They are ventilated by port-holes and perforated apertures above them, while the vitiated atmosphere escapes up three upcast shafts in the passages, similar to those provided for the abstraction of the atmosphere in the saloon. Each cabin is fitted with an electric light in an opal globe, which can be turned off when desired and also with a swinging candle lamp, for use if the electric light should accidentally be cut off.

The second-class saloon, which is on the after-part of the main deck, occupies its full width. This also is a very spacious and comfortable room. It contains two tables with swinging settees in the inner and fixed settees on the outer sides, covered with leather. It is lighted by a good skylight, and is ventilated and heated similar to the first-class saloon. There are several fixed bunks at the sides of the second-class saloon.

Below this saloon there is good sleeping accommodation for both sexes of passengers. Their cabins have also substantially the same sanitary arrangements as regards space for sleeping and ventilation. Each steamer carries two stewardesses.

The tables are laid for meals in the saloons upon the embarkation of passengers, and are cleared in about an hour subsequently. Other refreshments can be served at any time during the voyage. Each ship carries an abundant supply of provisions, and also a reserve supply in the event of an emergency.

The victualling of the ships is carried out by the Great Eastern Railway Company under the superintendence of their hotel manager at Parkeston Quay, Harwich, and the *cuisine* and wine lists will be found excellent in quality and exceedingly moderate in price.

At this port an excellent hotel and splendid first and second class restaurants, and waiting-rooms in connection therewith have been provided for the accommodation of passengers by the *v.* The whole are most elaborately decorated and

furnished, and afford the greatest comfort to those waiting for steamers and trains. They are under the superintendence of the manager of the hotel. The hotel booking-hall, restaurants, waiting-rooms, and lavatories form one building, and are lighted by electricity. The building is connected with the railway station and the quays, from which the steamers arrive and depart by a covered passage. All the rooms in the building are open at and shortly before the arrival and departure of the steamers. The hotel is always open, and a night porter is kept to attend upon visitors. It is used as a storehouse for the supply of provisions for the steamers and restaurants. In it there is a good general dining-room, drawing-room, reading and smoking-rooms, and lavatories, suites of private apartments, dressing and bath-rooms.

The first and second-class restaurants, the entrances to which are from the booking-hall at opposite side, are very large and lofty rooms. They are both provided with excellent serving-bars, with marble tops, and tables for refreshments. They are warmed by open fireplaces. On the steamers from Antwerp and Rotterdam being signalled, the barmaids and waiters who attend in them are roused from their sleep to prepare these rooms for the reception of the passengers on their arrival at Parkeston Quay, and to have refreshments then ready for them. These duties are punctually performed, and the passengers can obtain hot tea and coffee, and other beverages immediately on entering the restaurants, which they sometimes do about four or a little after, in the morning. The waiters speak several languages. Passengers to the North of England, and the Midland Counties, who have to wait until after 7 a.m. before their train departs, can also be served with hot meat breakfasts from the hotel after six in the morning.

There are well-furnished waiting-rooms for ladies travelling first and second-class, and which have superior lavatory accommodation connected with them. There is also excellent lavatory accommodation for gentlemen travelling either class, near the restaurants. The best sanitary arrangements have been carried out as regards this that can possibly be found. The large booking-hall is used for the examination of the luggage of passengers from the Continent in the winter. It is comfortably warmed by two fires, one on either side. In the summer and autumn the luggage is examined in a long shed adjacent to the landing-place on the Quay.

The steamers of the company arrive at and depart from Parkeston Quay, Harwich, daily, except Sundays, to and from Antwerp and Rotterdam. In connection with the outward steamers an express train leaves Liverpool Street Station at 8 p.m., and arrives at Parkeston Quay at 9.40. A second express train in communication with these night steamers leaves Doncaster at 4.48 p.m., Manchester at 3 p.m., and Birmingham at 4 p.m., in connection with express trains from Scotland, the North of England, and the Midland Counties. Through carriages are attached to these trains.

The ships for the Continent leave Parkeston Quay at 9.50 p.m. They arrive at Antwerp at about 9.30 and at Rotterdam about 9 on the following morning. A train leaves the Quay du Sud, at Antwerp, where the passengers from Harwich land and starts for Brussels direct at 9.40 a.m., where it arrives at 10.42. A special train will, however, leave this Antwerp Quay for Brussels if the steamer from Harwich does not reach Antwerp in time for passengers to proceed by the 9.40 train.

Passengers to and from Rotterdam by the companies' ships land and embark at the West Quay. A train leaves Rotterdam for Amsterdam at 10 a.m., in connection with the steamers that arrive at the former place an hour or so previously, and arrives at Amsterdam at 11.19. Excellent arrangements exist at Antwerp and Rotterdam for the conveyance of persons holding through tickets to various parts of the Continent.

The steamers leave Antwerp and Rotterdam daily, except Sundays, for Parkeston Quay, Harwich. They start from the first-named place at 6 p.m., and from Rotterdam at 6.30 p.m., and generally reach Harwich about 4 on the following morning. A train leaves Brussels at 4.43 p.m., in connection with the Antwerp boat, and runs alongside at the Quay du Sud, at that port. A train also leaves Amsterdam with passengers for the night steamer that leaves Rotterdam for Harwich. Shortly after the arrival of these two steamers a special express train leaves Parkeston Quay for London, where it generally arrives about 6.50. For passengers to the North of England, Scotland, and the Midland Counties, an express train leaves Parkeston Quay Station at 7.43 a.m. Through carriages are run by this train to Doncaster, Manchester, and Birmingham.

from which there is direct communication to the North and the Midlands.

An excellent system of through bookings has been provided between England and the Continent. Appreciable means have also been adopted for the registration and examination of baggage, full particulars of which may be obtained from the Continental booking-office of the company at Liverpool Street Station, London, from 9.30 a.m. until 8 p.m. (except Sundays), and at other railway stations of the company.

The London, Brighton and South Coast Railway Co. own some excellent passenger ships running between Newhaven and Dieppe. This company work in partnership with the Western of France Railway Co., a service between London and Paris, via Newhaven and Dieppe and Rouen, which is the shortest route between these two capitals, the distance being only 233 miles, and which has been described as the most picturesque.

For many years, however, the route has been under the great disadvantage that Newhaven and Dieppe were tidal harbours, whereby the steamers had to be worked at varying times, and to effect ebb as well as flood passages, the former necessarily being from two to two hours and a half longer than the latter. In 1876, however, a company was formed under the guarantee of the London and Brighton Railway Co. to acquire the rights of the Newhaven Harbour Commissioners and to make material improvements mainly intended to remedy this grievance.

At a cost of about £550,000 the Newhaven Harbour Co. have so deepened and enlarged the harbour as to enable a fixed service to be run with passenger steamers. At the same time similar improvements were carried out at Dieppe by the French

Government Engineers, and although the works are not so far advanced as those at Newhaven, the result enabled the London and Brighton Railway Co. to open, on the 1st of June, 1889, a double fixed service, the journey between London and Paris being performed by day-time in nine hours and a half, and by night in eleven hours.

The trains leave Victoria and London Bridge Stations, the services being performed at the following times:—

#### DAY SERVICE.

Victoria ..	dep. 9.0 a.m.	Paris ..	dep. 9.0 a.m.
London Bridge ..	9.0 "	Rouen ..	" 11.9 "
Newhaven ..	" 10.35 "	Dieppe ..	" 12.45 p.m.
Dieppe ..	" 3.9 p.m.	Newhaven ..	" 5.30 "
Rouen ..	" 4.26 "	London Bridge arr.	6.40 "
Paris ..	arr. 6.30 "	Victoria ..	" 7.0 "

#### NIGHT SERVICE.

Victoria ..	dep. 8.50 p.m.	Paris ..	dep. 8.50 p.m.
London Bridge ..	" 9.0 "	Rouen ..	" 11.25 "
Newhaven ..	" 11.0 "	Dieppe ..	" 1.0 a.m.
Dieppe ..	" 4.23 a.m.	Newhaven ..	" 6.0 "
Rouen ..	" 5.41 "	London Bridge arr.	7.40 "
Paris ..	arr. 8.0 "	Victoria ..	" 7.50 "

The whole of the passenger steamers of the London and Brighton Railway Co. were constructed by the Fairfield Shipbuilding Co., Glasgow, expressly for the service between Newhaven and Dieppe. They are entirely built of steel, and the following particulars will show that they are fast, commodious and well appointed ships:—

#### PARTICULARS OF PADDLE STEAMERS.

Ship's Name	Dimensions			Tonnage		Passenger Accommodation				Nature of Engines	No. of Boilers	No. of Cylinders	Working Pressure per Sq. Inch	Nominal Horse Power	Speed, Average Knots
	Length	Bre'dth	Depth	Gross	Net	1st	2nd	3rd	Total						
Paris .....	250	29	15-25	760-98	325-98	466	108	132	706	Cmpnd.	4	2	110	485	19½
Rouen .....	250	29	15-25	760-98	325-98	466	108	132	706	"	4	2	110	485	19½
Brittany ..	231	27-7	10-4½	578-78	239-29	347	101	131	579	"	4	2	100	350	18
Normandy ..	231	27-7	10-4½	579-84	239-92	347	101	131	579	"	4	2	100	350	18½
Brighton ..	221-3	27-7	10½	531-28	315-8	330	92	32	454	"	4	2	80	300	15

The *Paris* and *Rouen* were built in 1888, the *Brittany* and *Normandy* in 1882, and the *Brighton* in 1878.

The accommodation for first-class passengers on board these steamers is as under:—

Steamer's Name.	On Deck Prom'nade	In Cabins. Berths No.	In Private Cabins. Berths No.	No. of Private Cabins.
Paris .....	360	88	18	5
Rouen .....	360	88	18	5
Brittany .....	173	162	12	4
Normandy .....	173	162	12	4
Brighton .....	175	143	12	4

The engines of the *Paris*, made by the Fairfield Shipbuilding and Engineering Co., are diagonal compound, having two cylinders, the diameter of which are 46 in. and 83 in., having a stroke of 6 ft. Their indicated H.P. is 3,400. The boilers are cylindrical tubular, having a working pressure of 110 lbs. per square inch. The fire-grate area is 71-75 square feet.

The crank shaft is 16 in. in diameter in the smallest part, with crank pins 14 in. diameter, forged solid with cheeks. The cheeks are securely fixed by keys to the shaft. The crank pins are connected by means of a "drag link," fitted with adjustable bearings. Her circulating pumps are Allen's centrifugal 14 in. diameter, with a direct acting engine arranged to pump through condenser tubes. This steamer, as well as the *Rouen*, is fitted with excellent forced draught apparatus. This draught is obtained by means of two

of Allen's direct acting fans, 6 in. diameter, driven by a horizontal engine fixed to the H.P. cylinder, 7 in. diameter and 7 in. stroke.

The electric light engine is one similar to such as is supplied by the Brush Co., 6½ in. diameter and 8 in. stroke.

The paddle wheels are on the feathering principle, and have the following dimensions, viz.:—Diameter to axes of floats, 17 ft.; number of floats in each wheel, 9; size of floats, 3 ft. 7½ in.

The engines of the *Normandy* are also diagonal compound, having two cylinders, 46 in. and 83 in., with 5 ft. stroke, and an I.H.P. of 2,520. Her boilers, like those of the *Paris*, are cylindrical tubular, having a pressure of 110 lbs. per square inch. The fire-grate area is 48-75 square feet. Her crank shaft is similar to that of the *Paris*. The paddle wheels of the *Normandy* are also the same as those in the *Paris*, except that the floats in the former steamer are 6 in. shorter than in the latter, and are 3 ft. 6 in. wide.

Our representative was kindly allowed to inspect the *Rouen* and *Normandy* at Newhaven. He found their accommodation remarkably good for the cross Channel service, in which they are used.

The *Rouen* has an excellent promenade deck, which occupies its whole width for a great length. It has accommodation for 200 first-class passengers. There is also a considerable amount of standing room for this class of voyagers on the paddle boxes and the steps leading to them. This deck has two fixed awning seats as well as side seats all round. In fine weather, buoyant reclining-chairs and camp-seats are also provided, which are much appreciated. There are three powerful electric light lamps of 50 candle power each, for embarking and landing passengers and cargo. Two of these lamps are at either end of the deck and the third in the centre.

The life-saving apparatus is also excellent, and greatly

beyond legislative requirements. It consists of four life-boats, four collapsible life-boats, and a superabundance of life-belts and life-buoys, buoyant cushions on the side seats of the deck, and floatable chairs, as before mentioned, &c. On the fore part of the promenade deck there is an efficient wheel-house with steam steering gear and telegraph for captain's use. The skylight of the engine-room is on the deck, and also four shafts for ventilating the stoke-holes and two for ventilating the first-class saloon and cabins. There is also a very useful hatch-way on the deck for taking in and unloading cargo, which when closed, which it is when the ship is ready for sea, is not noticed by the passengers, as the lid of each is on a level with and forms part of the deck.

The steamer has also a good fore-castle deck for second and third-class passengers, and which, though narrow for their use, has broad whalebacks at either side.

Two-thirds of the quarter-deck is for the use of first-class, and the remainder forward of the engines for that of second and third-class passengers. On the aft part of this deck there are five private cabins for first-class passengers. These are panelled very tastefully in oak, maple, and walnut, and are further embellished with carved and gilded columns. They have each also a mirror, and embossed glass windows. The seats are covered with rich red velvet, and the floor is well and comfortably carpeted. These cabins are heated at an agreeable temperature by steam pipes under the seats, protected by perforated metallic coverings. The ventilation of these apartments is effected by perforated plates at the top of the panels, and communicates with one of the ventilating shafts on the promenade deck. There is also good lavatory accommodation in these cabins.

There is a very luxuriously furnished smoke-room provided on the aft part of the deck. It is panelled in dark oak, and is ornamented with artistic columns, having carved capitols, relieved with gold. The ceiling is of white and gold. This room is provided with fixed cherry-wood revolving chairs, upholstered in Russia leather, and side seats covered with morocco. There is a superior marble-top table in the centre, and bevelled mirrors at the sides. The lighting of the room at night is very æsthetic, and gives a most sumptuous appearance to the apartment. It is illuminated by clusters of four opal globe electric lights. The ventilation of this enclosure is from large square windows and from perforated plates at the top of the sides, which are connected with shafts on the promenade deck.

At the fore part of the deck, and underneath the fore-castle deck are the officers' and seamen's quarters, and fixed seats for second and third-class passengers. There are two shafts on the latter deck for the better ventilation of the space underneath, as well as of the officers' and seamen's quarters and the second-class and passengers' cabins.

The first-class saloon on the main deck is very spacious, and contains berths for about eighty passengers. The sides and ends are panelled in oak and maple, and are further ornamented with hand-painted figures and fluted columns with carved capitols, respectively relieved in gold. The ceiling is of white and gold. A very commodious table is placed in the middle of the saloon, over which are fixed trays between artistic pillars, for glasses, casters, &c. Fixed revolving mahogany chairs, covered with red velvet, are provided for use at the table. The other seats and berths are similarly upholstered, while the floor is well carpeted also. There are two artistic bevelled mirrors, and in the saloon a very good serving bar, carving-table, and steward's pantry at the entrance.

At night the saloon is very tastefully illuminated by the electric light from opal lamps, in well-arranged clusters on the summit of the ornamental pillars over the table in the centre. In the daytime the room is well lighted by an ornamental skylight and large port-hole windows, 18 in. in diameter. The ventilation of the room is also effected by the skylight port-holes and a continuous-plate having small apertures in the top of the sides and ends, and which communicate with the fan funnel. The saloon is heated by steam-pipes under the lower berths at the sides. The pipes are protected by perforated openings in the metal coverings.

A luxuriously-furnished ladies' saloon or cabin, for first-class passengers, is provided near the former saloon, which is decorated, furnished, lighted, and ventilated in substantially the same way. There is, however, no refreshment table, or fixed chairs in this cabin, as the ladies who occupy it use

the first-class saloon for their meals. There is good lavatory accommodation in connection with both saloons.

A very comfortable and spacious second-class saloon and ladies' cabin for second-class passengers, with sleeping berths in each, are also on the main deck, forward of the engine-room. They are ventilated, heated, and lighted, in substantially the same way as the first-class saloon.

The *Normandy*, which our representative also inspected, affords almost the same amount of accommodation to all classes of passengers as the *Rouen* and *Paris*, which are the newest and fastest ships of the London and Brighton Railway Co.

All the passenger steamers of the company carry a stewardess. A hot meal is provided for the day and a cold collation for the night service. Third-class passengers are only carried by the night boats.

The passenger trains of the company run to and from a new station at Newhaven, which is parallel to and within fifty feet of the edge of the quay, and from which the steamers arrive and depart. The passenger portion of the station extends about 100 yards, and includes, in addition to the marine superintendent's and general offices, a first-class dining-room, first and second-class restaurants or bars, similar to those found at first-class railway stations, general and first-class waiting-rooms, and ladies' waiting-room, excellent lavatory and other sanitary arrangements, and a baggage-room for the examination of passengers' luggage. This last-mentioned room, which is for the examination of the luggage of passengers arriving at Newhaven, is an exceedingly comfortable and spacious enclosure, and is well warmed in the winter. It contains immense tables, systematically arranged for the efficient and expeditious examination of baggage.

The dining and refreshment rooms are open for the accommodation of passengers by the boats and trains running in connection therewith. The company has also a very good and convenient hotel close to its refreshment rooms, which it serves with provisions. The hotel is much appreciated by passengers to and from the Continent.

There are powerful cranes on the quay for loading and unloading passengers' luggage.

A Pullman drawing-room car is run on the special day express train each way between Victoria station, London, and Newhaven harbour. The trains at Dieppe also run to and from the harbour alongside the steamers. The carriages used by the service between Dieppe and Paris are superior. They are fitted up with the Westinghouse patent continuous brake and a communication between the passengers and guard.

Tickets are now issued direct to and from Paris by the Newhaven and Dieppe route from and to stations on all railways north of the Thames. The single tickets are available for ten days and the return tickets for one or two months, according to the fare, with liberty for the holders to break their journey at London, Brighton, Newhaven, Dieppe and Rouen. A good system exists for the examination of outward passengers' luggage at Paris, and for its registration between that capital and London and *vice versa*.

Between London, Rouen and Paris 66 lbs. of luggage is allowed free to each passenger. Any extra weight will be charged for at 1d. per lb.

For the convenience of passengers by the Newhaven and Dieppe route, special interpreters are appointed by the Western of France Railway at Dieppe and their Paris station, St. Lazaré. Buffets and refreshment rooms are also provided at the quay at Dieppe and at Rouen station.

Arrangements have been made with the Railways Passengers Assurance and the Ocean and Railway Assurance Companies for the issue of tickets to cover accident to passengers on the journey to Paris and back at the rate of 6d. or 1s. each. Tickets issued from London or any of the London and Brighton Railway Co.'s stations to Paris and *vice versa* are available either by the Rouen or Pontoise routes.

The London and North Western Railway Co. have a service of fast passenger steamers of a superior type, running between Holyhead and Dublin. They have also some other good passenger ships running between Holyhead and Greenore. The great increase in the number of passengers conveyed in these steamers during the last eight or nine years, testify to their appreciable accommodation. The following table gives the more essential and detailed particulars of these steamers, viz:—

Vessels' Names.	Built.	By whom.	Length Ft.	Breadth Ft.	Depth Ft.	Speed. Knots.	Engines.	Built.	By whom.	Boilers.	Built.	By whom.	Working Pressure.	Registered Tonnage.	
Anglesey (Twin Scw.)	1888	Harland & Wolff, Belfast.	301	33	13	15	Triple Expans'n.	1888	Harland & Wolff.	Two Steel Double-ended.	1888	Harland & Wolff.	160	45	Built of Steel.
Banshee (Paddle) ..	1884	Laird Brothers, B'head.	310	34	14	18½	Common.	1884	Laird Brothers.	Eight Steel Tubular, Single-ended.	1884	Laird Bros.	32	240	do.
Cambria (Twin Scw.) Tug Boat..	1889	do.	145	25	13	14	Triple Expans'n.	1889	do.	Two Steel Double-ended.	1889	do.	160	nil.	do.
Duchess of S'thland (Twin Scw.)	1869	Leslie & Co., N'castle.	251	30	14	14	do.	1888	do.	Two Steel Double-ended.	1888	do.	150	111	Altered from Paddle to Twin Screw by Messrs. Laird Bros., 1888. Built of Iron.
Earl Spencer (Paddle) ..	1874	Laird Brothers.	253	29	14	14	Common.	1874	do.	Eight Steel Tubular.	1884	L. & N. W. R. Co.	25	373	do.
Edith (Paddle) ..	1870	Leslie & Co.	250	30	14	13	do.	1870	Stephen-son & Co.	Six Iron Tubular.	1882	do.	20	274	do.
Eleanor (Paddle) ..	1882	Laird Brothers.	254	30	14	15	C'pound Dis-c'n'n'cting.	1882	Laird Brothers.	Four Iron Tubular.	1882	Laird Bros.	75	337	Built of Steel.
Isabella (Paddle) ..	1877	do.	254	30	14	15	Common.	1877	do.	Eight Steel Tubular.	1888	L. & N. W. R. Co.	30	337	do.
Irene (Twin Screw) ..	1885	Harland & Wolff.	301	33	13	15	C'pound.	1885	Harland & Wolff.	Two Steel Double-ended.	1885	Harland & Wolff.	80	110	do.
Lily (Paddle)	1880	Laird Brothers.	300	33	14	18	Common.	1880	Laird Brothers.	Eight Iron Tubular.	1880	Laird Bros.	30	230	do.
North Wall (Twin Scw.)	1883	R. Duncan & Co.	300	33	12	14½	C'pound.	1883	Rankin & Blackmore	Two Iron Double-ended.	1883	Rankin & Blackmore.	80	162	do.
Olga (Twin Screw) ..	1887	Laird Brothers.	301	33	13	15	Triple Expans'n.	1887	Laird Brothers.	Two Steel.	1887	Laird Bros.	150	119	do.
Rose (Paddle) ..	1876	do.	291	32	15	15	Common.	1876	do.	Twelve Steel Tubular.	1887	L. & N. W. R. Co.	30	401	Built of Iron.
Shamrock (Paddle) ..	1876	do.	291	32	15	15	do.	1876	do.	Twelve Steel Tubular.	1886	do.	30	401	do.
Violet (Paddle) ..	1880	do.	300	33	14	18	do.	1880	do.	Eight Iron Tubular.	1880	Laird Bros.	30	230	Built of Steel.

The *Banshee*, *Lily*, *Violet*, *Rose* and *Shamrock* are Express Passenger Boats running between Holyhead and Dublin; they have saloons for first and second-class passengers, fore cabins for third-class passengers. The sailings are:—From Holyhead: Night Express, 2.0 a.m. daily (Mondays excepted); Day Express, 4.45 p.m. daily (Sundays excepted). From Dublin: Day Express, 9.30 a.m.; Night Express, 7 p.m. daily (Sundays excepted). *Banshee* is lighted by electricity. The *Earl Spencer*, *Isabella* and *Eleanor* are passenger, cattle and cargo boats, running between Holyhead and Greenore. These boats are fitted with saloons and fore cabins. The sailings are: From Holyhead, 1.35 a.m. daily (Sundays excepted); from Greenore, 8.45 p.m. daily (Sundays excepted).

The Twin-screw Boats perform the cattle and cargo service between Holyhead and Dublin. These vessels carry deck passengers only, and have no saloon. The sailings are: From Holyhead, 5.15 a.m. and 7 p.m. daily (Sundays excepted); from Dublin, 12.30 p.m. and 8.0 p.m. daily (Sundays excepted).

The speeds given above are the average speeds at which the vessels run, but they are capable of working up to about a knot more if pressed. In this case *Banshee* would be 20 knots, *Lily* and *Violet* 19½ knots, and so on.

The engines of the *Banshee* are two direct-acting vertical jet condensing, oscillating. The diameter of cylinders is 80 in. The engines of the *Lily* and *Violet* are similar, except the diameter of their cylinders, which is 78 in. The intermediate shaft of each ship is cranked, and works the air pumps. The diameter of the crank pin of the *Banshee* is 20½ in., and that of the two previously mentioned ships half an inch less. The main crank pins of the *Banshee* are 13 in. in diameter, tapered in the cranks. The taper is about 1 in. in 15½ in. The pins are secured by cotters. Similar pins are used in the *Lily* and *Violet*, but they are 12½ in. in diameter, while they taper about 1 in. in 14½ in.

The *Banshee* has eight rectangular steel tubular dry-bottomed boilers. Six of the boilers have three furnaces each, while two boilers are each provided with four furnaces. The entire fire-grate area is 510½ square feet, and the pressure is 32 lbs. per square inch. The *Lily* and *Violet* have also respectively eight rectangular

iron tubular dry-bottomed boilers. Each boiler has three furnaces. The total fire-grate area is 480 square feet, and the pressure 30 lbs. per square inch. The paddle-wheels of the *Banshee* are 23 ft. 6 in. in diameter to axis of floats. The number of floats is 11, and their dimensions 11 ft. 6 in. by 4 ft. 6 in. The paddle-wheels of the *Lily* and *Violet* are 23 ft. 10 in. in diameter to axis of floats. The number of their floats is 11, and their size 11 ft. 1 in. by 4 ft. 6 in. The electric light engine of the *Banshee* is one of Brotherhood's three-cylinder engines. The cylinders are 7 ft. 5 in. in diameter, and 3½ stroke. The lights are incandescent, on Swan and Edison's system.

The *Banshee*, *Lily*, and *Violet*, are of the same type, and similarly arranged for passengers. Our representative has just been permitted to inspect the *Lily*, which appears to him eminently suited for superior passenger accommodation. This steamer has a large promenade-deck extending the whole length

and breadth of the ship. The aft part is for first and second-class, and the fore part for third-class passengers. An excellent smoking-room is provided at the aft part of this deck. It is panelled with bird's-eye maple, relieved with ebony and gold. The ceiling is white and gold. There are embossed glass railway-carriage windows at the sides which can be opened. It is well furnished, and is illuminated at night by candles from ornamental brackets. There are three openings in the ceiling for ventilation, which communicate with ventilating-shafts. This room has also an electric-bell for calling the stewards. There are numerous skylights and ventilating-shafts on this deck for lighting and ventilating saloons, cabins, &c. The stoke-hole is also well ventilated. The life-saving apparatus is of the best kind, and is in excess of Board of Trade requirements. Part of the quarter-deck is covered for the use of third-class passengers, who are also allowed on other parts of this deck.

The first-class saloon is a very large room for a steamer of her tonnage, and has been specially made for the accommodation of the great number of passengers who use it between Holyhead and Dublin. The sides are panelled in bird's-eye maple, relieved with ebony and gold, while at the sides of the port-holes are elegant hand-painted figures. The cornices are of ebony and gold, and the ceiling white enamel and gold. There are two embossed glass skylights in the centre of the saloon. It is further lighted by large port-holes round the sides. The floor is covered with oilcloth. There are four tables on either side of the saloon for refreshments. Dinners are served at 6.45 p.m. just before leaving Dublin, and cold joints on returning thereto. There are continuous seats at the sides, and settees in the centre and for use at the inner sides of the tables. There are fixed mahogany trays over each table. At the entrance end of the saloon there is an excellent steam heater for keeping joints, chops, steaks, &c., warm. This arrangement is seldom found in a saloon, and is very much appreciated. The steward's serving-bar, near this apparatus, is a very spacious one, compared with the majority to be seen in a saloon. This large room is illuminated at night with ten ornamental paraffin lamps. It is heated by a central stove, and is ventilated from the two skylights and port-holes, and from perforated plate apertures above the latter, which communicate with the funnel.

Second-class passengers are allowed to have their meals in the saloon.

On the lower deck, and immediately under the saloon, there are twelve private cabins, having in the aggregate 57 sleeping berths. Twelve of them are in the passage, and are termed outside berths. They are all of mahogany. The seats in these cabins are upholstered in red plush, and the arrangements generally therein are all that can be desired. The cabins and passages are well ventilated by port-holes, and a horizontal shaft running through them for the escape of vitiated air, and which shaft is in communication with the funnel. Good lavatory arrangements have been provided in connection with these berths. There are also two gentlemen's private cabins near to and on a level with the saloon, which are well furnished and ventilated, and provided with lavatory accommodation. A ladies' private cabin adjoins the saloon near the entrance. This cabin contains two rooms leading out of it, which are used for their sleeping berths. The cabin is well decorated, much in the same style as the saloon. It is also luxuriously furnished, and is well lighted and ventilated by skylights and port-holes, and perforated apertures above, and is illuminated at night with ornamental paraffin lamps. There is also on the lower deck, just below the ladies' private cabin, another and larger cabin for first-class passengers of the fair sex, which occupies the full breadth of the ship. There are sleeping berths on each side. The sides and ceiling of this elegant room are decorated in the same manner, substantially, as the general refreshment saloon. There are two folding toilet tables in this room. It is lighted from port-holes and the skylight of the ladies' cabin above, and is illuminated in the evening as the saloon is. It is ventilated not only from port-holes and the skylight just mentioned and perforated apertures above the port-holes, but also by a horizontal shaft fixed near the ceiling, containing numerous openings, which shaft communicates with the funnel. There are four private ladies' cabins adjoining this room, which are very comfortable, and are lighted and ventilated as the other private cabins before described. They are all illuminated at night with candles in brackets.

a large and well-decorated second-class cabin

forward on the main deck for sleeping. It is lighted by two skylights and numerous port-holes, and is efficiently warmed by a steam heater, and illuminated at night by paraffin lamps. Comfortable lounging seats, or berths, are fixed at the side. This apartment is ventilated by perforated plates near the ceiling at the sides, communicating with a shaft on the promenade deck, as well as by port-holes and the skylights.

An excellent hotel and restaurant, railway station, waiting-rooms, and cloak-room, have been built by the company close to the quay for embarking and landing passengers. Refreshments can be obtained at the hotel and restaurant shortly before and shortly after the departure and arrival of the steamers from Holyhead, as well as at other times. The hotel is much appreciated by passengers in bad weather, several of whom stay there until better sea voyages can be made. The hotel and restaurant is under the superintendence of the manager of the company's hotel in London, and the best arrangements are carried out for the comfort of passengers.

(To be concluded in our next.)

## BRISTOL CHANNEL PORTS.

### III.—NEWPORT.

NEWPORT is a place which appears to the writer to possess a character peculiarly its own. For example, few people would imagine it possible to board an Epping Forest tramcar in this enterprising Welsh town; yet not so long since, one used to be calmly jogging along Commercial Street. Then its Dock Street, where shipping men most do congregate, is less bustling than one would imagine, bearing in mind the shipping importance of the town. Indeed, a casual observer might term Newport a "one horse place," but the statistics which we shall produce in the course of this article will show that it would hardly be fair to put this stigma upon the port. It is quite true that the chief ambition of young Newport is to find his way to Cardiff, where he lunches at the docks and catches the six train home. We are inclined to believe that this desire is due to the idea that having to take the train to business each day is much like London; the part of the "City" being taken for Cardiff, that of the "suburb" by Newport, and somehow this relationship strikes us whenever we are in this part of South Wales, for you always find Cardiff men in Newport streets. As a matter of fact, a considerable amount of the Newport trade is done in Cardiff, for Cardiff appears to secure all the coal orders, as she secures nearly all the offers of tonnage. Why Cardiff should be preferred by anyone to Newport we cannot say. The other day we were talking over the subject with a well-known shipowner, who told us he much preferred Newport; he found it cheaper than Cardiff, and there was, in addition, more room to move about in the docks. This latter is an advantage the Newportians would probably rather not possess.

The shipping statistics of the port are interesting reading. We find that about a hundred years ago, in 1791, there entered the port 202 vessels, representing 10,580 tons; and about this date Newport occupied an inferior position to Chepstow. The earliest record we have of the coal shipments of the port is from 1797, when 6,939 tons were shipped; but in three years time this increased to 32,277 tons, and continued increasing until last year, when the foreign coal shipments were 50,000 tons, and the coastwise coal shipments over 130,000 tons less than the preceding year. As a matter of fact, the port's shipment all round, patent fuel excepted, were less for 1888 than they were for 1887. But notwithstanding this decrease, Newport occupies the third importance in the quantity of coal it exports. In iron also Newport occupies an enviable position; so far as rails are concerned, it is the premier port, and in iron generally, it is far above Cardiff, the figures for 1888 being 147,533 tons for Newport, and only 53,490 for Cardiff. It also beats Cardiff in its exports of tin plates, and its imports of iron ore. As a shipowning port Newport is of small importance, possessing only five steamers of over 1,000 tons register; but here again do we find a trace of Cardiff's influence. There can be no gainsaying the fact that at the present moment Cardiff is the Welsh port, and all firms doing any Welsh trade find their way to Cardiff. A number of Welsh shipowners have branch offices in Newport, such as John Cory & Sons, Pyman, Watson & Co., and L. and H. Guéret; but their steamers are nearly all registered from Cardiff. It is due to Cardiff, we believe, that Newport's coal shipments fall off

last year, for a quantity of coal which should have been shipped at Newport found its way to the more important place. A short time since, a new line, named the Pontypridd, Caerphilly, and Newport, giving direct communication between the Rhondda Valley and Newport was opened, but it seems to have had no effect upon the trade of the latter port. The fact of the matter appears to be, that no South Wales port can succeed unless Cardiff firms take it in hand, and Cardiff herself has to rely upon strangers, for the greater number of her business men have been imported. Something of the same applies to Newport, for her chief man is Sir George Elliott, a Durham man. It is he who has done more for Newport than any one else, and had he taken the place in hand sooner, it would, probably, have occupied a better position than it does to-day.

Up to the present only one half of Newport appears to have been properly developed. Nearly all her industries are on one side of the river Usk. One bank is crowded, the other is ornamented only with the works of a local dry dock company. This is due, it appears to us, to lack of railway communication. There is practically none on the eastern side of the river, but we believe there is a scheme for constructing a line on this side, and should the new line be completed, it will open up most valuable sites for works.

Oddly enough, for South Wales, Newport is not overburdened with dry docks. Up to a few years back there were only three, two worked by Messrs. Wordly, Carney & Co., Limited, the other a commercial dry dock, the property of the Alexandra Dock Co. A few local capitalists formed a company for constructing a new dry dock on the east side of the river, and this is now being worked by Messrs. Laing & Williamson. There are, however, a number of repairing shops, some of which are of considerable importance.

There are in the vicinity of the town some extensive iron and steel works, such as the Tredegar, Blaenavon, and Ebbw Vale, and in addition, numerous tin plate works. Within the past 10 years also the advantages of the place as a site for works have attracted the attention of various inland manufacturers, such as Nettlefold's and others, who have established works in the district.

On one point we cannot compliment the "powers that be" of Newport. Some months since we wrote to the secretary of the dock company, as we wrote to Sir William Thomas Lewis, and Mr. Dixon, of Swansea, about the merits of the port, but up to the present moment have had no reply. From Sir William and his most courteous harbour-master, Captain Pomeroy, and from Mr. Dixon, we had the fullest information. In fact, in the first instance, certain returns were specially compiled for us. This Cardiff and Swansea courtesy gave us a very good opinion of the South Wales ports, which even the discourteous silence of the Newport officials cannot reverse. It is, of course, possible that Newport aims at big things, such big things, in fact, that even the press cannot help her in her conquering course. Perhaps, also, Newport cannot understand not having to pay for a notice; and as we publish the present series of articles for the benefit of those interested in our various ports, and without any communication from our advertisement manager, Newport officials are "flabbergasted." But, never mind, Newport, you will be a great place when you persuade the Admiralty, as you purpose trying to persuade them, to steer their ironclads to your river for bunkers.

### THE WHITE STAR LINER "TEUTONIC."

THE new steamship *Teutonic*, of the White Star Line, arrived at Liverpool on Monday, July 29th, after her first trial cruise. She is characterised by several novelties, and is especially interesting on account of her being the first merchant vessel built to comply with the conditions of an Admiralty subsidy. As she took part in the review of the fleet at Spithead, she is fitted with four of her complement of 12 guns. They are of the type commonly known as 5-in. guns, having a range at extreme elevation of over five miles. The charge consists of a cartridge of 12 lbs. and a steel forged shell of 45 lbs., containing a bursting charge of 2 lbs. A shot at 200 yards should penetrate a 5-in. plate of wrought iron; and it is estimated that half the shots fired should hit a target less than a yard square at a mile distant. The guns are to be placed six on either side upon the promenade deck, and those at present in position are fixed at the extremities of the ship.

The vessel has been built by Messrs. Harland & Wolff for Messrs. Ismay, Imrie & Co., and may be regarded as absolutely the safest ship afloat. She is fitted with twin screws; and the whole of the machinery, engines, boilers, and coal for working either screw is shut off completely from its neighbour by a fore and aft bulkhead, which extends from the after end of the engine-room to the forward end of the foremost coal bunker, and in fact intersects the six largest of the 12 watertight compartments made by the 11 ordinary transverse bulkheads. This fore and aft bulkhead is pierced by only one locked door, the key of which is held by the chief engineer. The doors between the engine-rooms and the stokeholes are in every instance duplicated, and the duplicate door is in every case under the control of the captain on deck. When liberated they close by their own weight, but by an ingenious contrivance their descent is freed from violence. Ascending from the door is a rod surmounted by a piston, which works in a cylinder  $4\frac{1}{2}$  in. in diameter filled with glycerine. When the door is allowed to descend, the whole of this glycerine has to pass through a half-inch hole in the piston, and the sluggish liquid thus prevents a rapid and dangerous descent of the massive door. There is, however, another and more interesting novelty about these doors. In the event of water flowing into the ship the doors will close automatically. As the water rises in the bilge it will buoy up a hollow piston attached to a rod. This rod on being pushed up about a foot removes the catch that holds the door; and it might chance that the first intimation of danger in the engine-room would be the automatic closing of these protective doors. The principle is common enough. It is merely an adaptation of the domestic ball cock; but, assuming the buoyancy sufficient for the work to be done, nothing could be more certain in its action. The introduction of the fore and aft bulkhead dividing the separate engines of a twin-screw ship has been objected to by high authorities on the ground that if one side were filled with water the list would be so great that the vessel would inevitably overturn, and that what was conceived as a means of safety would become a source of certain danger. It has, however, been experimentally demonstrated in this case that if the two largest compartments on one side of the fore and aft bulkhead were filled the list would be only 12 deg., and facilities are at command to correct this by pumping in water on the other side.

The engines are triple-expansion, with three cylinders of 43 in., 68 in., and 110 in. in diameter, and they have been constructed to develop 17,000 H.P. The pistons have a 5 ft. stroke, and the machinery, in accordance with Admiralty requirements, has all been placed below the water line. The boilers are twelve in number. Some are 12 ft. and some 12 ft. 6 in. in diameter and 17 ft. long, with six furnaces in each and a grate area of 1,163 ft. The furnaces are fed with forced air to a moderate extent above the fuel and under the grate, and the boilers are designed to work up to 180 lbs. The initial pressure in the intermediate cylinder is 80 lbs., and in the low about 16 lbs., with a vacuum of seven. The full pressure was not reached during the experimental cruise; indeed, some of the furnaces were not lighted, nor has there been, as yet, any trials of the maximum speed. She is fitted with two of Durham Churchill & Co.'s, latest improved universal marine engine governors.

The propellers, which are 21 ft. 6 in. in diameter, with a pitch of 28 ft. 6 in. and a superficial area of 128 ft., form a subject of special interest in this ship on account of the unusual manner in which they are placed. They overlap each other to the extent of 5 ft. 6 in., or, in other words, they each extend over the centre line 2 ft. 9 in. The centres of their axles are 16 ft. apart; and the port side propeller is 6 ft. forward of the starboard, measuring from boss to boss. The port propeller is a left-handed screw and the starboard a right-handed; thus both work away from the ship; and the port propeller working in the loose water of the after screw makes two revolutions a minute more than its twin. The propeller shafts are 199 ft. and 205 ft. long respectively, and are entirely encased to the boss of the screw. The hull is very much cut away under the stern, and a large space has been cut in the frames to admit of the massive casting that carries the screw shafts. The stern post is connected with the rudder post by a bar on the line of the keel in the ordinary way, the scheme of allowing the rudder to be suspended without support below having been abandoned as dangerous. Her bottom is coated with Hartmann's Rahtjen's composition.

The vessel herself is 532 ft. long—the longest ship afloat—57 ft. 6 in. broad, 33 ft. 4 in. deep, and has a gross tonnage of

9,685 tons. She has a cutter stem, and, relying wholly on her two sets of engines, the masts are little more than three bare poles without yards. Thirty feet up the foremast is a sort of crow's nest for the look-out. Accommodation is provided for 300 first-class, 150 second, and 750 steerage passengers. She has a promenade deck 245 ft. long, with a clear way of 18 ft. on each side of the deck-houses. Some portion of this promenade is covered by an awning deck, which is used for stowing the boats.

For the fittings and decorations throughout the boat, it must suffice to say that they are unusually lavish, even in these days of sumptuous ocean travelling.

Among those on board during the cruise were the Marquis of Stafford, Mr. Forwood, M.P., Sir Edward Reed, M.P., Mr. Royden, M.P., Sir Nathaniel Barnaby, Admiral Sir F. W. Richards, Mr. Dunn, Chief Constructor of the Navy, Mr. Trail, of the Board of Trade, and Mr. Martel and Mr. Parker, of Lloyds'.

The White Star steamer *Teutonic*, has, we are happy to say, made the fastest maiden trip on record across the Atlantic, and this notwithstanding very heavy adverse weather. She arrived at New York on Wednesday, August 14th, having made the passage in 6 days 14 hours 20 minutes. Her days' runs were as follows:—394, 404, 430, 431, 440, 454, 227 miles.

### TRIAL TRIP S.S. "EMPRESS."

CONSIDERABLE interest has recently been displayed in shipping circles in West Hartlepool and neighbourhood regarding the new passenger steamer just completed by Messrs. Wm. Gray & Co., Limited, for the Hamburg line of steamers run by the West Hartlepool Steam Navigation Co., of which Mr. Thomas Barraclough is the manager. On Thursday, August 22nd, the vessel proceeded on her trial trip at sea, with a view to test her capabilities. The vessel is 270 ft. long, with a breadth of 31 ft. 6., and depth 16 ft., and is built of mild steel and classed in the highest class at Lloyd's. She is of the partial awning deck type, with openings between the poop, bridge and fore-castle for the convenient working of cargo down the three hatchways. The main deck is of steel, sheathed with wood, for the comfort of passengers. The after part of the vessel is fitted up in a most comfortable style, there being a long dining saloon brilliantly fitted and finished, and arranged with first-class state-rooms along the two sides. There is a special cabin for ladies, and at the head of the staircase a pleasant little smoking-room for gentlemen. Amidships there are the engineers' cabins, chart-house and wheelhouse, the latter being fitted with a high-class steam steering gear, and forward a large part of the ship is fitted up for the accommodation of emigrants. Every part of the vessel is fitted with the electric light, supplied by the Brush Electric Lighting Co., which, in the saloon and especially in the state-rooms, is so infinitely superior to the usual oil lamps in comfort to the passengers.

The main engines for propelling the vessel were manufactured at the Central Engine Works, and are of their triple-expansion type, working on three cranks, and are of high power, having cylinders 25 in., 40 in., and 65 in. in diameter, with 42 in. stroke. They are supplied with steam at 160 lbs. working pressure by two large double-ended boilers, which were found on the trial day to be capable of keeping the steam regularly at the blowing-off point, with the engines running full speed, and indicating 1,700 H.P.

The vessel left her moorings on the early morning tide, and proceeded at once to have her compasses adjusted by Mr. Berry. The engines were then gradually brought up to their full speed, and at about 10 o'clock the tug boat *William Gray* took off to her a large party of ladies and gentlemen interested in the trial. There were present amongst others Messrs. Henry, Arthur and the Misses Young, Mr. Barraclough and Mr. C. Webster, representing Mr. C. W. Webster, of Pallion Hall, the owner of the fleet; Mr. Matthew Gray, Mr. Baines, Mr. Henry Withy, Mr. George Pymman, jun., Mr. T. H. Tilly, Mr. and Mrs. and Miss Binning, Messrs. C. and T. Robins, Miss Buckle, the Misses Appleby, Miss Smith, Mr. R. T. Snaith (Darlington), also the Board of Trade surveyors, Messrs. Wotherspoon and Jackson, Mr. Austin, Lloyd's surveyor, Captain Wright, marine superintendent of the company, and Mr. R. Newton, the superintendent engineer.

The vessel was then directed towards the south, and a run

was made at full speed as far as Whitby, the vessel being kept close in shore, so that the passengers might have the pleasure of viewing the coast line continuously from Coatham to Whitby. The run from Hartlepool to Whitby was accomplished in an hour and a half, and, making allowance for a slight tidal current in favour of the ship, this shows the speed of the vessel to have been just about 15 knots per hour. The engines ran throughout the day without the slightest hitch or trouble of any kind, the revolutions at full speed being 90 per minute, the whole of the bearing surfaces keeping perfectly cool without the application of water. There was a heavy ground swell on the sea during the day, and the softness of the rolling of the vessel was universally commented upon, there being no jerk or unpleasant motion whatever, and vibration at the stern of the vessel from the action of the propeller was totally absent. The vessel being headed for Hartlepool, the engines were run at half speed to make the visit to the saloon for the purpose of luncheon as pleasant as possible for the ladies, but the majority preferred to remain on deck; the engines were speedily brought up to full-speed again for the return journey, which was correspondingly accomplished to the satisfaction of everybody on board. The vessel received her passengers and luggage, and proceeded on Saturday afternoon on her first voyage to Hamburg, to and from which port she will now regularly run, at a speed of 14 knots an hour. It would seem that, if sea travelling can be made pleasant, the builders of this vessel have succeeded in making it pleasant on board the *Empress*, and we have no doubt she will greatly aid in popularising the Hamburg and Hartlepool route to and from the Continent.

### NAVAL HYGIENE.

THE *Lancet* says:—"Equal in importance to a seaworthy fleet is it to have seaworthy sailors, and whilst we are engaged in testing the fighting qualities of our ships we ought not to forget the men to whose care they are committed. . . . One fact is evident, that discontent exists among the seamen and petty officers on board certain of the more modernly-constructed ships, not on account of unavoidable discomforts brought about by the exigencies of their construction and the necessary sacrifice of space for the accommodation of huge coal bunks, enormous boilers, and machine-worked guns, but because no adequate attempts seem to be made to improve conditions of life on board. Ever since the days of Lind the medical officers of our fleets have endeavoured to the utmost of their ability to improve the condition of the sailor's life on board ship; and we have only to turn to the text-box on Naval Hygiene to see what excellent work has been effected. But, unfortunately, their efforts have not always been appreciated or seconded by the authorities, and many hints, which, if adopted, would have improved the sanitary conditions of recently-constructed ironclads, have been passed over unheeded. Among the many desirable improvements would be a re-arrangement of the sailor's dietary. The science of victualing ships has made enormous strides of recent years, but with all this the sailor's dietary is even more defective than the soldier's, which has recently been subjected to severe criticism. The allowance as it stands is defective in quantity; it is also too frequently, as we hear, defective in quality. Owing, moreover, to the crowded condition of the ships, sufficient space is not always allowed for the cooking ranges, and many minor discomforts arise from this which might be obviated by the employment of improved ranges. We pass over the monotony of the prescribed rations, merely remarking that there is no excuse for them nowadays, and that a more varied dietary could easily be arranged at no extra cost. But we must heartily condemn the practice of serving out nothing after the mid-day meal till the mid-day meal of the next day except a little tea or cocoa with hard biscuit. This cannot be sufficient to keep a man in health, exposed as the sailor is to cold and wet above and to steam and damp below deck. What refreshment can there be after the previous evening fast, to come down after a night or early morning watch to a breakfast of dry biscuit and cocoa? Instead of allowing the men to gorge themselves at mid-day, the allowance should be divided, and a good evening meal secured. We could speak of many other points calculated to improve the health of the men and render the service more popular, and such reforms must be undertaken if we hope to man our fleets with really seaworthy sailors."

## NAVAL CONSTRUCTION AND ARMAMENTS CO., LIMITED.

THE Naval Construction and Armaments Co., Limited, has just issued the accounts, having been made up to June 30th. The directors state that, although the company was incorporated in February, 1888, the yard at Barrow has not been actively in operation, except to a very limited extent, for more than about eight months, the first eight months of the company's existence having been mainly occupied in reconstructions and additions to the yard and machinery, which have resulted in the company being now in a position to undertake work of the largest and highest class. Under these circumstances it has been deemed expedient to extend the financial year beyond the first eight months to the 30th June, 1889, that being the close of the company's financial year. In dealing with the question of profit and loss, no credit has been taken for the increased values of the materials purchased, nor for any work in progress, but only for the profit on work completed, which is necessarily but a small proportion of that contracted for, the unfinished contracts on the 30th June amounting to £437,000. In view of the initial expenses incidental to every new company, and the fact that nearly all the large contracts are unfinished, the directors are not in a position to declare a dividend, but the balance carried forward and the profits on unfinished contracts will tend to increase the profits on the current year. Having regard to the large amount of orders actually in hand, and to the prospects of further profitable contracts, the directors look forward with confidence to the future of the company. Since the 30th of June the company have received an order from Her Majesty's Government to build three second-class cruisers. The fact that this important contract has been entrusted to the company affords gratifying evidence of the confidence of the Admiralty in the resources of the Barrow yard, and the ability of its administration. The company has been further invited by the Admiralty to tender for first-class cruisers. All the preliminary expenses in connection with the formation of the company have been written off. The proposed works at Bilbao are for the present in abeyance, the directors having concentrated all their efforts to perfect the Barrow yard. Four vessels of a combined tonnage of 17,500 tons have already been contracted for with the Pacific Steam Navigation Co., and one of these vessels, the *Oruba*, of 5,600 tons, was delivered in a perfect state of completion in less than 12 months from the signing of the contract. The *Oruba* is now on a voyage to Valparaiso and back, and has afforded the highest satisfaction to her owners. The accounts show a margin to credit of £5,356 15s. 11d., which is carried forward to next year. Only £300,000, which is half the authorised capital, has been called up.

## THE JUNIOR ENGINEERING SOCIETY.

THE summer excursions of the current session which are now taking place in connection with this Society, have up to the present time included a visit to the Tower Bridge Works, by the kindness of Mr. Wolfe Barry; an afternoon and an evening visit to the R.M.S. *Britannia*, of the P. & O. Line; the former occasion taking place when the vessel was berthed in the graving dock, and the latter by the courtesy of the directors, on the eve of its despatch, and, consequently, at the most favourable time for an inspection. Dulwich College Engineering Laboratory has also been visited, Mr. F. W. Sanderson receiving and showing the party round. A demonstration on the experimental steam-engine formed part of the programme. At the Crossness Sewage Pumping Station, visited on 13th July, the engines, boilers, reservoirs, &c., of the existing works were seen, and the opportunity which was afforded of going over the new extension works now in course of construction was much appreciated, the visitors having the advantage of the company of Mr. F. E. Houghton, resident engineer, who fully explained the many points of interest. The latest visit took place on August 1st, to Messrs. Brin's Oxygen Works, at Westminster, where the ingenious plant employed by them for the extraction of oxygen from the atmosphere by means of baryta was seen in operation.

## LLOYD'S VISITATION COMMITTEE.

THE members of this committee continued their inspection of the works in the Newcastle district on Saturday, 17th August. One section of the committee proceeded to Blyth, and made a survey of the shipbuilding yards there. The other section drove to Newburn, and were shown over the steel works of Messrs. John Spencer & Co., Limited. Here they found steel castings in every stage of manufacture. Messrs. Spencer may be said to have been the pioneers of the introduction of cast steel of the high quality now so generally used for such a variety of purposes for which wrought iron used to be employed. This is not confined to castings of simple forms, but includes castings like anchors, crank shafts, tiller quadrants, locomotive driving wheels, &c. The committee were much interested in all that they saw, and expressed themselves as highly satisfied with the apparent excellence of the work performed in these works. One of Mr. Wasteneys Smith's patent cast steel anchors (of which Messrs. Spencer have turned out about 300 during the last twelve months) was tested by the drop and hammering tests in the presence of the committee, and proved satisfactory. Upwards of 1,700 of these anchors have now been made, some over 6 tons apiece, and the demand has latterly increased so much that this department is at present extremely full of work. After luncheon, which was served in the handsome new offices of the company, Mr. Spencer proposed the health of Mr. Tindall, the chairman of Lloyd's Committee, to whom he gave a cordial welcome to Newburn. His company and Lloyd's had ever been the best of friends, and he was always glad to meet the committee on their tours of visitation, which he thought contributed to the benefit of all concerned.—Mr. Tindall returned thanks. Lloyd's Committee, he said, came round, amongst other objects, for the purpose of gathering information, and they had learned much from their inspection of Messrs. Spencer's most interesting works. He complimented Mr. Spencer on the fact that Newburn, which was the birth-place of engineering, was still keeping well abreast of the times, and turning out work of the highest excellence. It was a source of much satisfaction to Lloyd's Committee to know that there was every desire on the part of Messrs. Spencer to produce steel only of the best quality, and that they had succeeded so well. In the course of some further remarks, Mr. Spencer alluded to the proposed large extension of the company's works now going forward. In addition to the extension of the existing works, a large plot of freehold land with a river frontage has been acquired for the erection of new steel works for the manufacture of steel plates, &c. Mr. Spencer said that they did not mean to introduce any untried processes or launch out on too large a scale without feeling their way. But the committee might rest assured that whatever the company did would be of the best possible description, and no expense would be spared to achieve the best results.

## STEAMSHIP CIRCULAR.

MESSRS. H. E. MOSS & CO., in their steamship circular dated August 21st, make the following remarks on the state of their trade:—

"An exceptional activity has prevailed since our last issue, dated March 12, 1889, and the amount of both new and second-hand steamship tonnage that has changed hands during the last six months has been unprecedented. Sales have not been confined to second-hand boats or to vessels under construction, but orders for new tonnage have been placed, with delivery extending into the latter half of 1890, far beyond what might have been expected, taking into consideration the large tonnage previously given out, and we may also add that the applications to builders for tenders during the last six weeks or two months show a marked increase over the previous four months. Prices for all descriptions of vessels are considerably higher than at date of our last issue, and materials used in shipbuilding, such as steel, iron, timber, &c., are dearer. Labour is already about 15 per cent. higher, and from the very unsettled feeling, especially among metal workers, builders in their tenders feel obliged to provide a margin for increased cost of construction. Taking all these disturbing elements into consideration, we are therefore compelled to inform our friends that higher prices will continue for some time, certainly well into the year 1890.

Another reason why high prices will be the rule and not the exception is that the Government orders already given out for 18 second-class cruisers means an amount of work that in many cases will withdraw certain firms from the open market, and the completion of the Government programme a few months hence will still further harden the prices quoted by our more important shipbuilding and engineering establishments. The inflation of business has so far had no bad effect, and shipping property is generally held by strong people well able to carry out any contracts they may make, and to hold the tonnage they already own. Freights generally are firmer, with every probability of higher rates, and the dividends paid show the employment has been satisfactory, and in many instances exceptionally so. Steel is still the favourite material for construction, and this in spite of an expressed opinion that corrosion is more rapid than in iron vessels, but our knowledge of chemical action is yet in its infancy. Foreigners have bought freely, the power of production in native yards being extremely limited, whilst the time occupied in construction handicaps

them unfavourably in their competition with our system and organization."

### BULL'S PATENT METAL.

**M**ARINE Engineers will be well acquainted with the freaks played them by gun metal at the temperatures of steam used in the modern marine engine, at which this alloy is quite unreliable. Most gun metals are, in fact, utterly rotten at about 400 deg. Fahr., the temperature of steam at 225 lbs.

With a view to ascertaining the properties of Bull metal at high temperatures, a series of experiments have recently been carried out by Mr. W. H. Stanger, of the Broadway Testing Works, Westminster. The tests were made on a 50-ton Buckton machine fitted with Wicksteed's autographic diagram apparatus. The results of the test with the accompanying stress-strain diagrams are given in the annexed Table and illustration.

#### BROADWAY TESTING WORKS, WESTMINSTER, S.W.

Report upon Six Specimens of Rolled "Bull" Metal received from the Maxim Nordenfelt Guns and Ammunition Company at various Dates in 1889.

Condition as Received. Plain Rolled Bars. Condition as Tested, Turned.

WSH. Test Number.	Marks.	Dimensions.	Diameter.	Area.	Reduction of Area at Fracture.	Extension.			On Original Area.				On Final Area.		Work done in Inch Tons per Cubic Inch. Corrected to a Length of 6 in.	REMARKS.  All Rolled Bars.
						Cn	On 2 in. at Fracture.	Elastic Limit.		Maximum Stress.		Breaking Stress.				
								Pounds per Square Inch	Tons per Square Inch	Pounds per Square Inch	Tons per Square Inch	Pounds per Square Inch.	Tons per Square Inch			
967	None	in.	sq. in.	p. c.	per cent. on 8 in.	per cent. on 6 in.	percent									Ordinary temperature. Silky fracture.
972	"	0.930	0.679	37.4	16.4	18.3	30.0	64,330	28.72	73,240	32.69	117,000	52.23	5.79		Temp. 400 deg. Fahr. Silky fracture.
973	"	0.913	0.655	50.5	14.6	19.8	36.0	47,190	21.07	56,770	25.35	114,800	51.24	4.84		Temp. 300 deg. Fahr. Silky fracture.
789	"	0.918	0.662	49.1	12.7	18.0	40.0	50,760	22.66	60,710	27.10	119,250	53.24	4.65		Ordinary temperature. Silky fracture.
807	"	0.874	0.600	36.8	31.5	31.5	40.5	42,930	19.17	67,980	30.35	107,600	48.05	8.55		Temp. 400 deg. Fahr. Silky fracture.
808	"	0.902	0.639	61.4	29.2	37.1	56.0	40,210	17.95	54,760	24.45	141,700	63.25	8.61		Temp. 300 deg. Fahr. Silky fracture.
970	"	0.900	0.636	60.5	29.6	36.0	55.0	39,450	17.61	59,700	26.65	151,250	67.52	8.78		Ordinary temperature. Silky fracture.
	"	0.910	0.650	23.2	11.6	—	21.0	64,060	28.60	79,360	35.43	103,380	46.16	3.99		Ordinary temperature. Silky fracture.

The Maxim Nordenfelt Guns and Ammunition Company, Limited, Erith Foundry, Erith.

(Signed) W. HARRY STANGER,  
pp J. GOODMAN.  
(Various dates.)

Mr. John Goodman, who personally conducted the testing, devised a simple but thoroughly effective apparatus for the purpose. A sheet-iron casing 10 in. in diameter and 18 in. high, covered with thick asbestos board, completely surrounded the test specimen, which passed through loosely fitting holes in each end. The lower part of the case was provided with a flue having a funnel-shaped end pointing downwards to receive the hot products of combustion from a Fletcher's gas ring furnace. A series of bafflers on the end of this flue prevented the stream of hot gases as they entered from playing directly upon the specimen; they were again spread by a loosely fitting circular sheet-iron plate in the lower part of the air bath. At first considerable difficulty was experienced at keeping even a moderately constant temperature in the apparatus; even when a double air-bath was tried the top would get much hotter than the bottom, or *vice versa*; this obstacle has been very effectually overcome in a simple and ingenious manner. A small fan 4½ in. in diameter, geared up to run at a very high velocity, was placed in the air bath, and served to keep the air thoroughly stirred the whole time. It was driven by hand from the outside by means of a cat-gut bow, working on a small pulley and gearing to give a speed of about 2,000 revolutions per minute; the reversal of motion at each stroke of the bow also served to

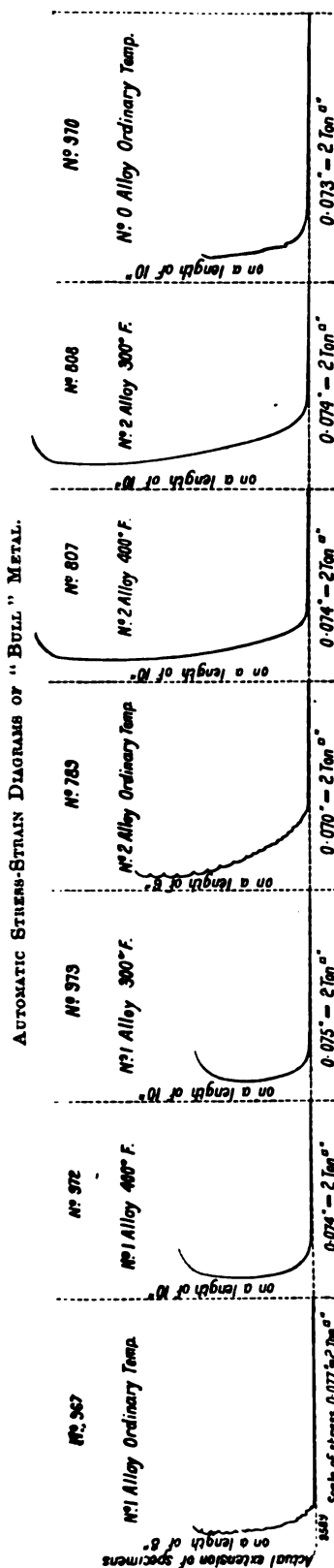
increase the stirring efficiency of the fan. It has proved so thoroughly effectual that the temperature in the casing can now be regulated to the greatest nicety by adjusting the gas supply and by opening or closing shutters at the top of the bath.

The attachment necessary for taking stress-strain diagrams was arranged exactly the same as in cold testing, sufficient clearance being allowed in the casing to prevent any interference with the extension wire. Holes were made in the side to allow of thermometers being placed close to the specimen; after the requisite heat had been attained, the temperature was allowed to remain constant for about a quarter-of-an-hour before the stress was applied, and during the test the projecting ends of the bars were clipped in the jaws of the machine in the usual manner.

All the specimens were turned down from rolled bars about 1 in. in diameter. The extension was measured on a length of 10 in.; in some instances the original bars were not long enough for two such lengths; hence some of the cold tests were made on 6 in.; for purposes of comparison the extension on 6 in. is also given; the bars were marked out in inches throughout their whole length in order to get the extension on the 2 in. immediately at fracture.

It will be seen that the influence of the high temperatures.

increases the toughness and ductility of the metal, as indicated by the extension and the reduction in area. The elastic limit and maximum stresses are reduced in about the same proportion, but even at 400 deg. Fahr., the temperature of steam of 225 lbs. square inch pressure, the strength of rolled Bull metal is equal to that of mild steel. The fractures show a beautifully fine silky appearance of great uniformity.



The cold stress-strain diagrams exhibit the peculiarity found in certain rolled alloys that the metal does not extend gradually as in iron or steel. The metal, on being tested, although the load was steadily and smoothly applied by the new hydraulic appliances that Mr. Stanger has recently had fitted to his machine, yet the steel yard rose and fell throughout the test as though the material were passing through a series of elastic limits or yield points. The beautifully regular and smooth curves obtained from this metal when hot, and with the majority of cold materials, proves that the action is peculiar to the metal. We were also informed that certain other high-class rolled alloys give exactly the same results.

Bull's metal is being manufactured at Erith by Messrs. the Maxim Nordenfolt Guns and Ammunition Co., Limited, under a sole licence for the United Kingdom, and under the management of the inventor. It is gaining ground among engineers for hydraulic and marine work. The licensees are using it extensively in connection with their own manufactures; and their special fuzes are either cut from bars by automatic machines or finished from stampings; the material must, therefore, possess perfect uniformity combined with extreme malleability and great strength; all other alloys tried for this purpose have proved unsuccessful. In connection with their guns and gun carriages the alloy is largely used in the form of castings, possessing almost twice the strength of good gun-metal, and, therefore allowing of great reductions in weights and dimensions. For the same reason the metal is used for the moving parts of

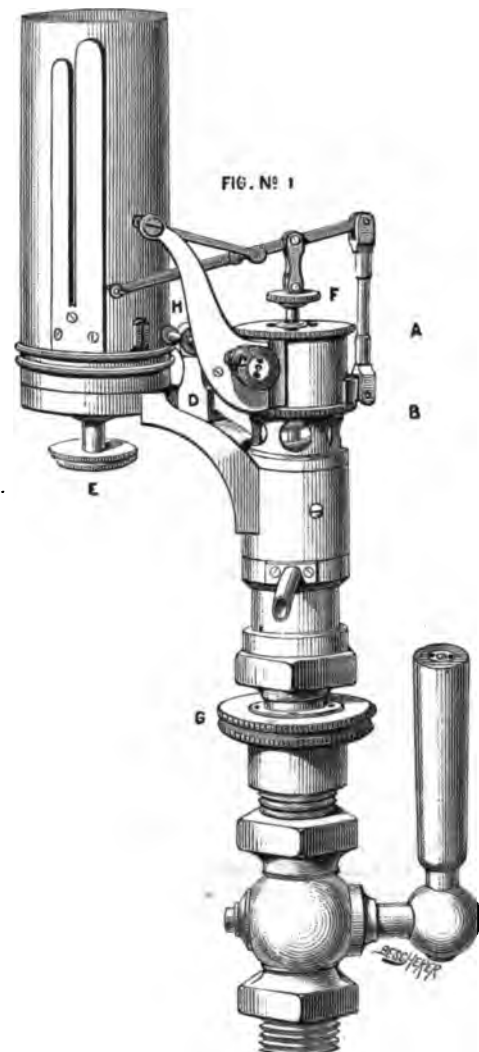
high-speed engines, where strength and lightness are of the greatest importance. For propellers, stern brackets, &c., the

alloy is particularly suitable on account of its great strength; such castings can be made as light as if steel were used, as no allowance for corrosion is necessary. As they would last as long as the ship, it is evident that the alloy for such purposes would in the long run be by far more economical than either steel or cast iron.

## PARIS EXHIBITION, 1889.

### LEFEBVRE'S IMPROVED STEAM INDICATOR.

AMONGST a number of exhibitors of steam indicators, steam and vacuum-gauges, and other light mountings for engines and boilers, M. Victor Lefebvre, of 70, Avenue du Maine, Paris, is specially worthy of mention, as amongst a large number of

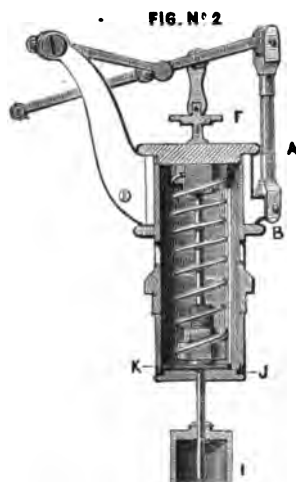


highly-finished articles of the aforementioned classes, he exhibits his patent steam-engine indicator, and as in its construction there are some features of interest, we have pleasure in giving an illustrated description.

M. Lefebvre, who has had for many years experience in constructing ordinary steam indicators, and in overhauling and repairing them, has had frequent occasion to observe that the indicator-springs when

placed in the steam cylinder, were deteriorated by various imperfections which altered the flexibility of the spring, ultimately causing great irregularity in the diagrams.

Many observations of this and other defects, has led M. Lefebvre to design, construct, and patent a new indicator, in which he has endeavoured to eliminate all the causes of bad working and rapid decay of such instruments. In Fig. 1 we give a general external view of Lefebvre's Patent Improved Steam Indicator, and in Fig. 2, a sectional view of the spring. It will be seen that the spring is placed in a separate cylinder, steam-tight at the bottom, and open to the atmosphere by five holes at B (Fig. 1). The spring being thus placed midway between the steam cylinder and the pencil guide, is completely preserved from the contact of the steam. Another advantage obtained by this arrangement is, that as the air—admitted to the cylinder containing the spring by the five openings in its circumference—freely circulates around the spring, its oxidation, heating, and consequent expansion is obviated. A collateral advantage, which we understand, has been obtained in practice, is that



there is no longer any irregular movement of the pencil, not uncommon in ordinary indicators. Probably, this latter feature is also partially if not mainly due to the method adopted in regulating the movement of the piston-rod.

Referring to our second illustration, it will be seen that the piston-rod is kept in position at three points, viz., at F, K and I (Fig. 2). This arrangement causes the piston-rod to maintain a perfectly straight course on both the up and down stroke, without play in the guides. A regular action is thus ensured, all tendency to any deviation or oblique thrust being avoided, as well as the consequential destruction of the true cylindrical form of the indicator's steam cylinder. The button F (Figs. 1 and 2) connects the piston-rod to the guide (Evan's) which actuates the pencil, and is readily regulated by the operator when necessary. The pressure between the pencil and the paper can be adjusted without any danger of the operator his fingers or tearing the paper. For this the arm which supports the Evan guide is with a screw which bears against a fixed

stop when the arm is swung in working position. With old indicators of the ordinary designs, it frequently happens that when it is attempted to obtain a more perfect action of the pencil on the diagram paper, that an undue pressure is obtained and the paper torn, but the patentee claims, and it would appear fairly, that this inconvenience is not to be feared when this improved indicator is used.

There is yet another feature to be noticed in Lefebvre's steam indicator, viz., the arrangement for attaching it to the indicator cocks on the steam-engine cylinders. Ordinarily the connection is effected by means of a differential nut, which when heated is sometimes difficult to unscrew. In this improved indicator, instead of a differential nut, a union joint G (Fig. 1) of sufficiently large size to be readily tightened or loosed is employed.

Summing up the advantages obtained by this improved steam indicator of M. Victor Lefebvre, the principal appear to be (1) more perfect working; (2) absolute regularity in the lines of the diagrams; (3) facility in mounting the indicator on the engine cylinders; (4) readiness in regulating the pencil; and (5) preservation of the flexibility of the springs.

Should any of our readers visiting the Exhibition, desire to see this indicator, they will find it in class 52, in the gallery of the Palais des Machines, near the central staircase, on the side of the building nearest to the Ecole Militaire.

## MACHINERY AT THE PARIS EXHIBITION.

MESSRS. F. W. REYNOLDS & Co.'s EXHIBITS.

**S**ELDOM, if ever, has there been seen at an exhibition such a number of good collections of wood-working machinery. Fortunately British manufacturers are not by any means in the background, and amongst those we noticed with well-filled stands was the firm of Messrs. F. W. Reynolds & Co., sawmill and general engineers, Acorn Works, Edward Street, Blackfriars Road, London. These exhibitors show upwards of a dozen of the latest types of improved machines in their special line. In mechanical power and hand-saws we noticed a "Queen" hand-power combined circular and band-sawing machine, with self-acting feed, and rising and falling spindle, constructed with a self-contained driving-shaft, from which power is communicated to the saw-spindle by means of a strong and durable driving chain below the table, suitable for a variety of purposes, including ripping, cross-cutting, rebating, grooving, tenoning, shouldering, bevel-cutting, feather-edging, curved sawing, and boring. In order to adapt it for so many purposes, the table is grooved for a sliding guide fence, which by a simple adjustment allows of material being cut at any angle. The fence plate can be canted for bevel-cutting or feather-edging, and readily removed for cross-cutting; the circular saw being made to rise and fall, may be regulated to suit the depth of the rebate, the groove or tenon; the table of the band-saw is made to cant for bevel-cutting, and the boring apparatus is ingeniously arranged.

A circular saw-bench, with fixed or rising and

falling spindle, a strong form, with gun-metal bearings for the spindle, canting and movable fence, &c., was also noteworthy, as also the "Empress" and the "Comet" hand-power band-saw machines. The "Empress" is driven by a chain from a self-contained counter-shaft, which increases the speed beyond that at which the handle is turned. As the chain is moderately loose, there is much less friction than there would be if driven by a belt, (which draws the two spindles together, and creates friction in the

bearings,) the tension of the chain being regulated by sliding the countershaft bearing up or down. A canting table, arrangements for power driving, are also amongst the features of this tool.

A vertical spindle moulding machine with dovetailing attachment, and which is also adaptable as a tenoning machine, is a first-class specimen of this class of tool—and evidently accurately and strongly constructed. A variety of mortising machines are also exhibited by Messrs. F. W. Reynolds & Co.

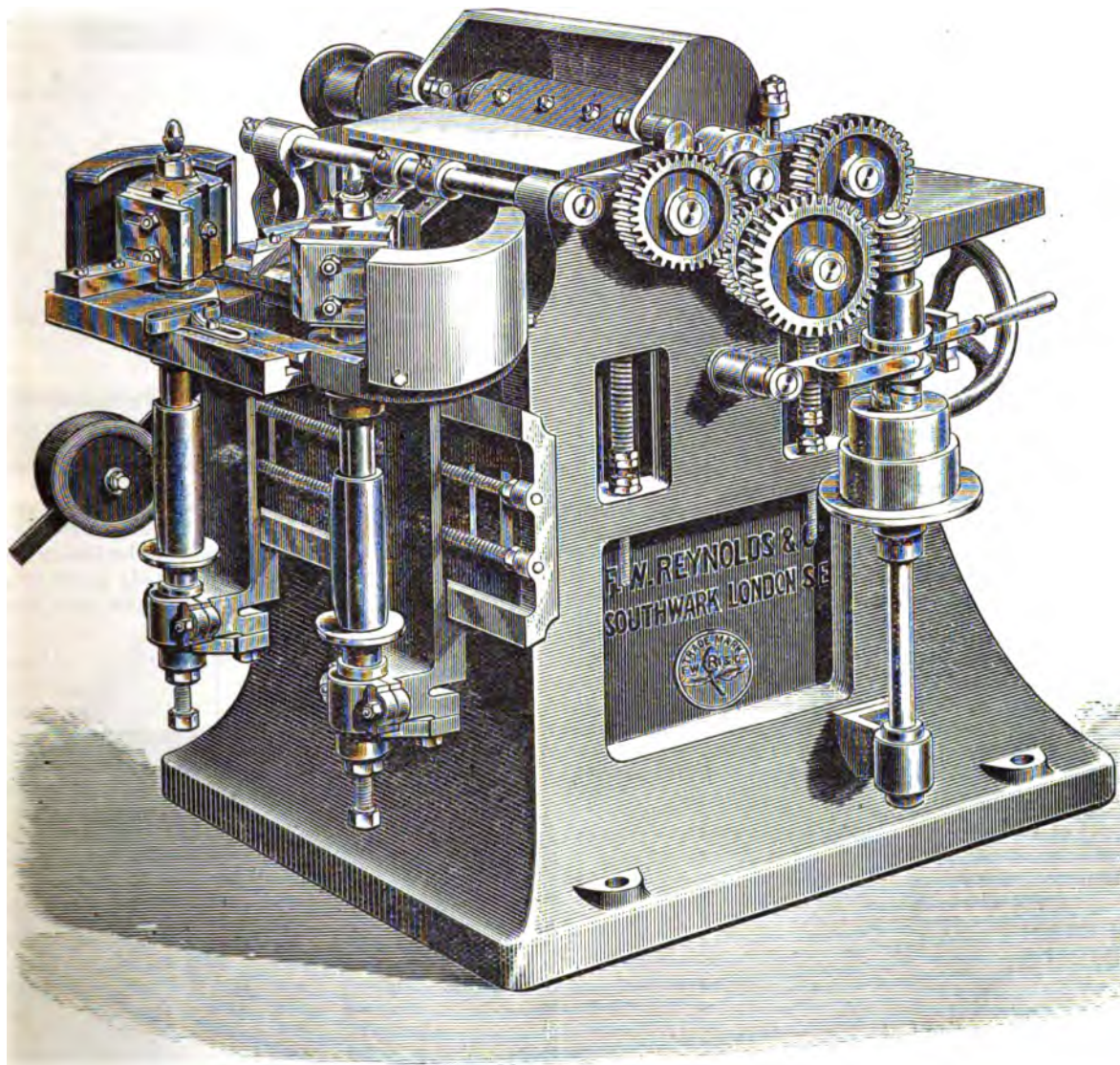


FIG. 1.

Four of these are for manual power, but each with a special feature—but pressure on our space prevents us detailing the differences.

The greatest novelty on the stand is, however, the combined panel-planing, thicknessing and moulding machine, and which we have pleasure in illustrating and describing (see Fig. 1). This is a highly-finished tool, of careful design and substantial construction. The upper horizontal spindle works in fixed bearings,

and the bed, carrying with it the two vertical spindles, is made to rise and fall by means of a screw and hand wheel, so that it can be adjusted to the distance from the cutter block necessary to give the required thickness to the work under operation. Feed rollers in front and behind the horizontal cutter block are provided for carrying the work through the machine, and bearing bars and top and side pressure springs are also fitted for keeping the work in position. The

side cutter blocks are made of wrought iron, and are fitted loose on the spindles, so as to be easily removed when required. The side spindles work in a special coned footstep, which being self-adjusting reduces the friction and vibration. This machine will plane any thickness from one-eighth inch to five inches thick, and of the full width of the table, viz., sixteen inches, and plane or mould on three sides at one operation up to a thickness of four inches. provision being made for fixing moulding-irons on any of the cutter blocks, so that the work can be moulded and planed simultaneously. Tongueing and grooving, and various other operations can also be performed by this machine, which is fitted with counter-shafts, having driving pulley for spindles and feed motion, and with three pairs of plane irons. The power required to drive the machine, illustrated in Fig. 1,—above described—is stated at 2 H.P., the speed of countershaft being 800 revolutions per minute. For a larger machine, planing up to 24 in. wide, 3 H.P. is required.

Messrs. F. W. Reynolds & Co., have also a number of other specialties in their stand including a malleable iron special floor cramp, a mitre-cutting machine, and an improved planing and trying-up machine, with rising and falling tables; but sufficient description has been given to show that the firm is well to the front, and although their stand may be surpassed in size, and their exhibits in number, for high qualities of design and construction they have nothing to fear.

### MESSRS. J. STONE & CO'S IMPROVED PORT-HOLE LIGHTS.

THE first three figures of the accompanying illustrations show, respectively, at Fig. 1, an outside view of Capt. J. McKirdy's port when open. Fig. 2 an inside view of same when closed, with fixed glass in centre, and Fig. 3, an inside view of port when closed, with glass in centre to open. Fig. 4 shows Mullan's patent simultaneous wedge-fastening side scuttle partly open, while Fig. 5 shows the same closed and with part of glass door cut away to expose loose ring.

Describing these arrangements together it will be seen that the new lights are a most decided improvement upon the old-fashioned wooden ports. They are, in each case, made of malleable steel, with brass working parts, brass frame for glass, &c., and present a neat and finished appearance from inside of cabin, or state-room, while they can be opened or closed with the greatest of ease and are always water-tight. There are no eye-bolts, cross-bars, or fly-nuts, and consequently there are no unsightly projections.

The glass circles in centre can be fitted of a much larger size than in the ordinary wooden ports, thus securing a great addition to the comfort of the passengers.

In the case of McKirdy's square port-hole light, close-fitting slides or curtains can be fitted up behind them. These ports open outwards, but are secured from the inside, so that there is no possibility of their being forced from the outside. The opening and closing of these ports is done in the simplest manner



FIG. 1.

by a T key with pinion, A, Fig. 2, which works in the rack shown in dotted line, and causes the brass frame to partly rotate and act simultaneously upon four or more equi-distant wedge pieces on door and frame,

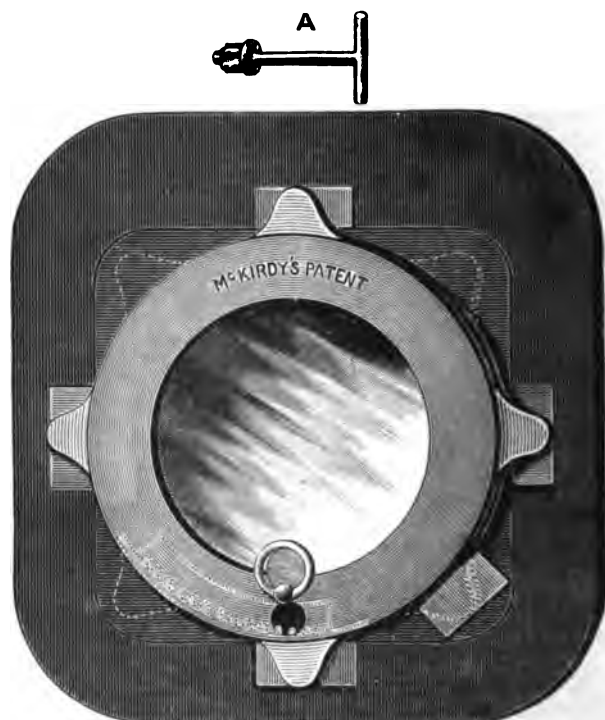


FIG. 2.

thus ensuring absolute and equal tightening up all round, a method of tightening which renders the port perfectly water-tight and precludes any danger of breaking the glass through springing of frames. It

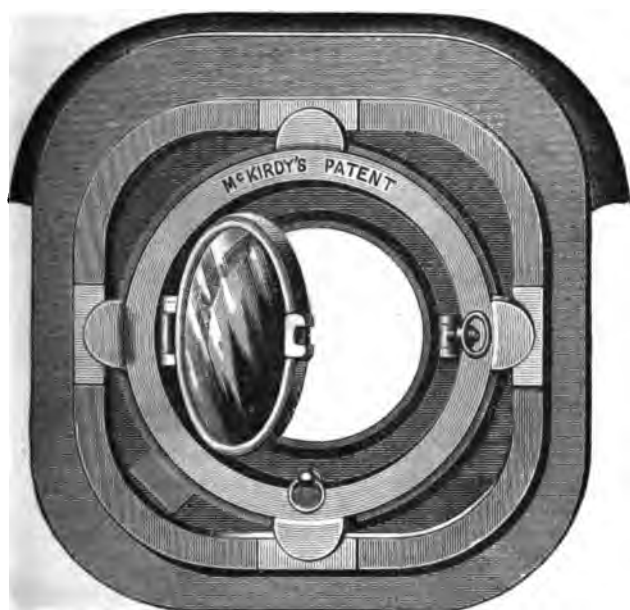


FIG. 3.

will be seen that the above description applies in great measure to Mullan's patent lights, the points of difference being rendered sufficiently clear by the drawings.



FIG. 4.

After a trial on the s.s. *Quetta*, of the British India Steam Navigation Co., these lights have been most favourably reported upon and adopted by that and many other lines of steamers.



FIG. 5.

Messrs. J. Stone & Co., of Deptford, London, S.E., are the sole manufacturers of these goods, and will be pleased to supply any information that may be required.

### PARIS EXHIBITION, 1889.

#### DUVAL'S PATENT METALLIC PACKING.

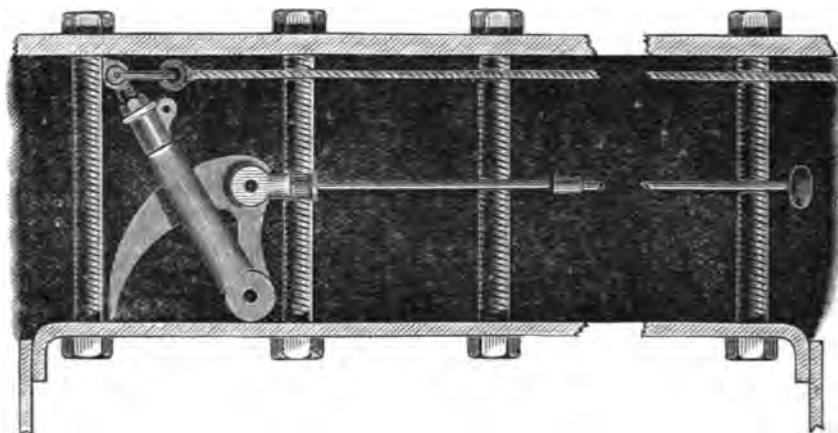
**M**ESSRS. DUVAL & FILS, 52, Rue de Dunkerque, Paris, amongst their exhibits, have their Patent Metallic Packing, of which we have pleasure in giving an illustration and description. It is formed of fine brass wire, plaited or braided into a square rope, and the mode of construction will be readily understood from Fig. 1. In [a sample we have carefully examined of 3-8ths in. square packing, there are hundreds if not thousands of distinct lengths of wire plaited together, each wire being continuous for the whole length of the packing, which is made in tresses of about 6 ft. 6 in. in length. In using it, the packing is cut off in lengths, and inserted into the stuffing-box in the usual manner, after which the gland is very lightly screwed up. As soon as the packing becomes warmed, the expansion of the wire presses it firmly against the rod and the interior of the stuffing-box, while the elasticity and extreme flexibility of the packing ensures the pressure always being of a gentle and yielding character, although quite sufficient to ensure a tight joint. In this respect it appears to have a considerable advantage as compared with solid metallic packing, which, if a rod be at all unfair, is soon destroyed. With Duval's patent packing the rod rapidly acquires a fine surface, which is always maintained, and the packing does not suffer from the heat of the steam however high the pressure may be. In one vessel, the s.s. *Ville de Montevideo*, nine voyages between Havre and Montevideo were

made, making a distance of over 150,000 miles, or ninety-six million strokes of the engine, without appreciable wear being shown in the packing. It has also been successfully employed in triple and quadruple expansion engines. Among British steamship companies that have adopted it are the Tyne Steam Shipping Co., Limited, the Allan Line, and the



Inman and International Steamship Co. It is fitted in the premier Atlantic steamship, *City of Paris*, in which it has given every satisfaction. It has also been employed in a gland under hydraulic pressure of five tons per square inch, and is fitted in H.M.S. *Camperdown*, the  $1\frac{1}{2}$  in. size being used in the glands of the high-pressure piston rods, and the 1 1-8th in. size in the high-pressure slide rod glands. Amongst the British manufacturers using this packing are Messrs. Fielding & Platt, of Gloucester; Messrs. Humphreys, Tennant & Co., Deptford; Messrs. Tangye & Co., Birmingham; and Messrs. L. Sterne & Co., London and Glasgow.

It is claimed for Duval's Metallic Packing that it will never harden or fire, is self-lubricating, and will last for several years when in constant use. Apparently there is a minimum friction between the packing and the rods, so that its duration is prolonged, and an important saving of engine power obtained.



In case of repairs being necessary to the engines, the packing can be taken out in rings and easily replaced.

We anticipate Duval's Metallic Packing will obtain a wide adoption, especially for high-pressure purposes, when better known, as, although its first cost may be relatively greater, its durability and other excellences make it actually economical. Mr. William Bashall, of Farrington Street, London, E.C., is agent for the United Kingdom.

### WRENCH'S BOILER-SCALING TOOL.

THE accumulation of scale and other incrustations in steam boilers, besides being the major contributory cause of many boiler explosions, is an acknowledged source of loss of evaporative efficiency, and its removal a notorious bugbear in the experience

of the engineers in charge. The scaling of boilers, therefore, though a matter of the first importance, is, as a rule, but imperfectly accomplished by the use of the ordinary appliances—scaling bars and hammers—especially in the confined and inaccessible parts of a boiler, and on the back and sides of combustion chambers, tube supporting plates, &c.

Our illustration shows an ingenious apparatus designed to obviate the difficulties in the way of perfect scaling, which has for some time been before the notice of steam users, and has received pretty extensive adoption. The tool is the invention of Mr. W. G. Wrench, Consulting Engineer, 5, Oswald Street, Glasgow. As will be seen from our illustration, it is very simple, consisting only of three primary parts, namely: the quadrant-shaped picker, the frame or strut to one end of which the arm of the picker is pivotted, and the rod or spindle by which the picker is actuated, reaching from the arms of the picker

(to which it is pivotted) to the hands of the operator. The end of the frame to which the arm of the pick is pivotted rests upon the plate or other part of the boiler to be scaled, whilst the other and lower end of the frame, which is suspended by a rope or chain, is held in contact with the opposite side of the space being operated in. Thus the frame, whilst always keeping the pick uniformly to its work, is adjustable to any angle within certain limits, to adapt itself to the varying width or taper of the

aperture or space within which the apparatus is being used, the frame in any working position being effectually held or jammed between the two opposite surfaces by the slightest tension on the suspending rope or chain. The picker is of forged steel throughout, so as to retain a durable chisel edge, and be capable of redressing and tempering, or otherwise fitted with a portable steel point. Worked even by a boy, it delivers solid and direct blows upon the scale, however distant from the operator, with the least possible physical effort and loss of time. The scaling tool is made in five different sizes, suited to spaces from  $3\frac{1}{2}$  to 10 in. in width, and it may be recommended as a light, portable, durable, effective, and inexpensive article, which all steam-users would do well to furnish themselves with.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from to July 25th to August, 24th, 1889:—

Bell, Edwin, engineer to the *Thames*, for temporary service, to date August 1st.  
 Hawkins, Frank W., engineer to the *Crocodile*, to date August 22nd.  
 Johns, Arthur J., engineer to the *Indus*, additional for charge of stores and engines of torpedo boats, to date August 24th.  
 Johnson, John B. D., chief engineer to the *Psyche*, to date August 17th.  
 Leigh, John, fleet engineer to the *Euryalus*, to date August 17th.  
 Salmon, Chas., staff engineer to the *Asia*, additional for steam reserve workshop, to date August 17th.  
 Shirvell, Jas., chief engineer to the *Blanche*, to date August 17th.  
 Ward, Wm. P., fleet engineer to the *Cambrian*, to date August 8th.

### HOAR & BROWN'S HARDWOOD MARKET REPORT, August 24th, 1889.

**TEAK.**—The deliveries for the four weeks ending August 16th, have been 1,670 loads, and for the seven months of this year 8,928 loads, against 9,540 loads for the same period in 1888, and 6,679 loads in 1887.

The Stock at the end of July stood as follows:—

1889.		1888.		1887.	
Logs.	Planks.	Logs.	Planks.	Logs.	Planks.
Moulmein 1,799 Lds.	818 Lds.	4,758 Lds.	775 Lds.	7,159 Lds.	424 Lds.
Rangoon 1,242 " 198 "		1,709 " 176 "		1,160 " 186 "	
Bangkok 1,602 " 226 "		1,514 " 888 "		2,573 " 477 "	
<b>Totals</b>	<b>4,643 Lds.</b>	<b>1,232 Lds.</b>	<b>7,961 Lds.</b>	<b>1,839 Lds.</b>	<b>10,892 Lds.</b>

The recent arrivals consist of a sailing vessel and a steamer, both from Burmah, but owing to the dock strike these vessels cannot be discharged.

The demand is very good as deliveries show, and prices are still rising.

Several inquiries for cargoes afloat have recently been made, but nothing has come of them, buyers being very loth to pay the prices asked. This they will, however, have to do, as the stock afloat is unusually small and all in strong hands.

The supply of teak at the various shipping ports is very restricted, and especially at Moulmein. A telegram in the *Times* recently mentions that the Siamese Government has confiscated no less than 3,500 logs which had been bought by the Moulmein shippers for shipment from that port as their best quality teak, thus proving what we have always maintained, that the difference between Burmah and Siam Teak is purely imaginary. Indeed, this fact has been admitted to a certain extent by the largest shippers from Burmah, who have now opened a branch house in Bangkok for the shipment of that teak, several cargoes having already come forward for their account.

This, moreover, is gradually being practically acknowledged

by the trade and consumers generally, who now use Bangkok freely, and in many cases in preference to Burmah, where at one time Bangkok would not be entertained.

This is, of course, due to the great care taken by the best shippers of Siam wood in selecting and manufacturing their logs.

**MAHOGANY.**—The stocks have been increased by the arrival of one or two small cargoes of Mexican, but it will be some time before these are put upon the market, as all work is at present at a standstill at the Docks. The last of the stock of Honduras was sold at auction on Tuesday last, when fair prices were realized. As there will be no further arrivals of Honduras mahogany until October or November, we may fully expect to see this class of wood standing at very high prices. The stock of Tobacco is generally of good character, and importers are putting it forward very sparingly, so that the present prices are certain to be maintained.

**WALNUTWOOD.**—There have been no fresh arrivals, and the trade still continues very dull. Imported planks and boards are selling fairly well, and a good demand still continues for the better qualities and sizes.

**WHITEWOOD.**—Sales are very flat. There is a little more doing in planks and boards, but no advance in prices. Stocks are of a very limited character.

**QUEBEC ROCK ELM.**—Two or three parcels have arrived during the month, mostly small wood, for which lower prices than those recently quoted have had to be taken. Prices for logs of good average size and quality are still maintained.

**YELLOW PINE.**—The demand for deck timber of good fair average quality has been brisk. Several parcels have changed hands at remunerative prices to shippers. There have also been imported two or three parcels of very prime Waney board pine, and the superior quality of this class of wood enables holders to find a ready market and good prices.

**QUEBEC OAK.**—Business is restricted to small orders. The high prices which continue to rule deter people from buying heavily.

**SEQUOIA.**—The parcel just landed is of very prime character, and will no doubt find ready purchasers at the present reasonable prices. This wood seems to be growing in favour, which is not surprising considering its magnificent dimensions.

General dock business is being greatly retarded through the strike, the work being practically at a standstill. The deliveries of timber will, therefore, not compare quite so favourably as would have been the case if the work could have proceeded in the usual way.

### ANGIER BROTHERS' STEAM FREIGHT REPORT, August 24th, 1889.

**FREIGHTS** since our last reports have not varied much, but the market has ruled dull with fewer transactions and a lack of firmness in rates. The China and far East trade has remained uniformly depressed and devoid of all life. India business showed some improvement, a better demand from Calcutta, Madras Coast, Bombay, and Kurrahee led to a few fixtures at very fair rates. From Malabar Coast and Persian Gulf one or two boats are bid for at good figures. From Azoff, Black Sea, and Danube rates have further declined, boats are less easily placed, and there is little sign of immediate improvement, although the Corn market closes firmer with more doing. Baltic Deal rates are down about 2s. 6d. per standard. Mediterranean Ore and Fruit rates also show a drop. American business was well sustained, at good rates, for Timber, Oil, Grain, Cotton, as well as berth cargoes, but the week closes with a dull market and weaker rates. From the Brazils and River Plate there is very little doing. Outward Coal rates are easy to Mediterranean and Eastwards, and 2s. to 3s. lower to the Azores and West Indies. Berth rates keep up to River Plate and Brazils, but to the East and Australia cargo is scarce, and rates have declined materially. Bunker coals are still dear, with little prospect of reduction in cost; contract prices for next year show a serious advance, as compared with last year. Seamen's and firemen's wages are maintained at the late advance.

New and second-hand steamers have advanced in value, and the last sales effected are at the top prices. Fresh orders have been booked by builders, but several firms are beginning to see through their work. Labour and materials keep dear, with a tendency to a further rise.

## INDUSTRIAL AND TRADE NOTES.

## THE CLYDE AND SCOTLAND.

OPERATIONS in all departments of shipbuilding and marine engineering on the Clyde have been vigorously prosecuted ever since resumption of work after the "Fair" holidays, and, as if rewarding the workmen's assiduity, additional orders have been pouring in from all quarters. Whether the workmen may regard the circumstance in this light or not may be doubted, but it cannot reasonably be denied that the one thing is a result of the other. As long as strikes were rife, and lock-outs were threatened, builders fought shy of new contracts, and owners were quite agreeable to hold off till more certain times. These, as regards workmen's wage demands and general steadiness, have now come; and this fact and the receipt of so formidable a list of important Government orders have had the effect of hurrying owners into the market to make matters secure before the further rise in prices of material and wages, which, it is only too probable, will follow upon the actual commencement of Government contracts. Most of the contracts recently given out by the Admiralty to Clyde builders fell to the lot of firms whose works are on the upper reaches, and it is with appropriate enough equity that the bulk of merchant ship orders recently placed should have fallen to the lot of firms on the lower reaches. Altogether, since the beginning of August some 22,000 tons of new shipping have been ordered from Clyde builders, while nothing like a corresponding amount of fresh tonnage has been put off from the stocks during the same period. The most important of the launches which took place during August was that of the *Friesland*, from J. & G. Thomson's Clyde-bank shipyard, a full-powered mail and passenger steamship of about 4,500 tons, for the Red Star Line. The most noteworthy of the vessels ordered is perhaps one of the Castle Line of South African steamers (Messrs. Donald Currie & Co.), the commission being entrusted to the Fairfield Shipbuilding and Engineering Co., who have already built so largely for the same company. The new vessel will be almost similar in dimensions to the *Hawarden Castle*, launched by the Fairfield Co. in 1883, but will steam at a faster rate of speed—15½ knots per hour. The *Hawarden Castle* has compound engines, but the new vessel will, as a matter of course, have the now universally approved triple-expansion type of engine.

Messrs. D. & W. Henderson, of Partick, are understood to have secured the contract to build a large five-masted sailing ship, to be the largest in the world, for Messrs. A. D. Bordes & Son, of Paris and Bordeaux. This contract has previously been reported as having been got by Messrs. Russell & Co., Greenock and Port-Glasgow, who are at present engaged on work for Messrs. Bordes. Messrs. Barclay, Curle & Co. have also contracted with the same firm to build a four-masted sailing ship, similar to the *Dunkerque*, built by Messrs. Russell & Co., and capable of carrying 5,000 tons. Messrs. Blackwood & Gordon, who are engineers as well as shipbuilders, have contracted to supply the engines, of 1,000 H.P., for the vessel above noticed, to be built by Messrs. W. Hamilton & Co., and they have also got the order to supply a new shaft and other repairs for a steamer owned in Germany. Messrs. Russell & Co. are placing the keel of a 1,600 ton sailing ship on the blocks recently vacated by the *Port-Douglas* in their east-end yard at Port-Glasgow. Messrs. Robert Duncan & Co. have booked an order for a large sailing ship, and it is understood that some of the other Port Glasgow builders have concluded contracts.

Messrs. David Macgill & Co., Irvine, have contracted with the Glasgow and Greenock Shipping Co., Glasgow, to build an iron screw cargo steamer for the coasting trade, 135 ft. between the perpendiculars, 21 ft. 6 in. beam, and 10 ft. depth of hold. The engines are to be put in by Mr. Wm. Kemp, Govan.

The shipyards and engineering works of Greenock and Port-Glasgow are in a very flourishing condition at present, and, at the latter place especially, the immediate prospect of the trade has not been so bright since 1883. Messrs. Scott & Co., Greenock, have secured orders to build and engine four steamers of 2,000 tons each. Two of these are for Messrs. Holt, of Liverpool, and two for the China Steam Navigation Co., Limited.

Messrs. David J. Dunlop & Co. have contracted to build and engine a special light-draught steamer of large power and carrying capacity, and to attain a high rate of speed. This

steamer is for Messrs. Vicente, Martinez & Co. Messrs. Wm. Hamilton & Co. have had an order placed with them for a steel screw steamer, to carry 2,000 tons, and to be fitted with triple-expansion engines, for French owners. Messrs. Blackwood & Gordon have arranged to build a steel screw steamer, of 650 tons, for Norwegian owners, to be fitted by themselves with a set of triple-expansion engines to attain a good speed. This vessel, intended for the fruit-carrying trade between America and the West Indies, is referred to further on.

The Grangemouth Dockyard Co. of Grangemouth and Alloa, who have at present a large amount of new tonnage on hand, besides a number of repair jobs, have recently added to their list of contracts one for as many as four steel screw steamers of medium tonnage. These steamers form part of a series of orders recently given out by Norwegian owners carrying on business in Bergen, who are confident of the success of new steamers being put upon the fruit-carrying trade between New York and Boston and the West Indies. This trade has for some considerable time been almost wholly passing into the hands of Norwegians, and previous to this projected addition, as many as 25 Norwegian-owned vessels were engaged in it.

Besides the Grangemouth Co., orders for similar vessels have been received (one each) by Messrs. Blackwood & Gordon, Port-Glasgow, Messrs. Fullerton & Co., Paisley, and T. B. Seath & Co., Rutherglen. The first-named firm, as has been stated, will also make the engines for the vessel they have on order; but in the case of all the other vessels—the four Grangemouth ones included—Messrs. Hutson & Corbett, Kelvinhaugh Engine Works, will supply the engines. The steamers are to carry 1,000 tons, the engines being of the triple-expansion type, capable of driving the vessel at a speed of 12 knots per hour. The Grangemouth Dockyard Co., in addition to the new contracts above noticed, have received orders to build two 1,400 tons sailing ships for Liverpool owners. These and the other two fruit-carrying steamers will be laid down in the recently-started Alloa shipyard, which, in the hands of this enterprising company, bids fair to have a lengthened lease of activity.

Most of the engineering and boiler works which sub-contract with outside shipbuilders are at present strained to their fullest capacity, and in many instances contracts are behind. Of the firms thus largely occupied, the following may be named:—Messrs. Dunsmuir & Jackson, Govan; Hutson & Corbett, Kelvinhaugh; Alley & Maclellan, Polmadie; J. & G. Thomson, Finnieston; James Howden & Co., Scotland, St. Kinning Park; and Messrs. Muir & Houston, Govan; Messrs. David Rowan & Co., a portion of whose works was destroyed by fire some time ago, are—notwithstanding the drawback of having to re-organise part of their premises—undertaking lots of work, especially in the boilermaking department. Messrs. Lindsay, Burnet & Co., of Moore Park, Govan, who confine themselves to boilermaking, are working night and day, a good deal of work being for engineers on the north-east coast, and for shipment abroad.

Two more of the specialised type of steamers designed to carry petroleum in bulk, have recently been finished on the Clyde. One was from the yard of Messrs. Hamilton & Co., Port-Glasgow, and the other from that of Messrs. Inglis, of Pointhouse. For the purpose of ascertaining, if possible, the most advantageous conditions of loading when employed in this special and somewhat difficult trade, Messrs. Inglis made a lengthy series of runs with their vessel at various drafts of water, and the result of these provides the owners with much useful data and experience of the vessel's characteristics under varying load and trim. The important question of the stability of the vessel in the critical conditions inseparable from this peculiar trade was carefully considered while the vessel was being designed, and the elaborate calculations then made have now been practically tested by filling the oil tanks one after another. It was found that, taking suitable precautions, four tanks could be filled simultaneously without producing any instability, and that a troublesome cause of delay and anxiety often occurring in vessels of this type has in this case been avoided.

On the 22nd inst. a number of the Tees River Commissioners paid an unofficial visit to Glasgow and the Clyde, and were escorted over the new Cessnock Dock Works and other points of interest on the river and harbour by Mr. James Deas the engineer to the Clyde Navigation Trust. The party were conveyed by one of the Trusts Harbour steamers as far as Greenock, whence the trip terminated; and on the way down river they inspected the Clyde Trust Engineering Works at Dalmauir, as well as several of the beacon towers above the

river channel, which, as is now well known, are lighted by means of compressed gas on the system patented by Pinctoch. The beacon burns night and day, thereby dispensing with the need for lighthouse keepers, the illuminant being stored in tanks, which are changed about over in three months from a specially constructed craft which, appropriately named *The Torch*, conveys the gas from the Trusts Gas Works at Port Glasgow. The system has been found to work most satisfactorily, and the Tees Commissioners expressed themselves as much interested by all they were shown. Another party of deputies reporting an important institution concerned with Clyde industries, recently paid the district a visit. This was the Committee of Visitation from Lloyd's Register of Shipping, London, who annually make a tour of the shipbuilding centres throughout the country. They arrived in Edinburgh from Newcastle on the 21st, and after visiting the yards at Leith and Grangemouth, paid a visit to the Forth Bridge. They afterwards proceeded to Dundee, and from thence to Aberdeen, from which they came on to Glasgow and the other Clyde ports. In connection with this visit of Lloyd's Committee of Shipping to the North, the General Committee of Lloyd's have intimated their intention of founding a scholarship, tenable for three years, of the annual value of £50, for students of naval architecture, at the University of Glasgow. This will be open to shipbuilders' draughtsmen all over the kingdom.

Prof. James Thomson has recently resigned the chair of Civil Engineering in the Glasgow University which he has occupied for several years, and which was formerly filled by the late Prof. Macquorn Rankine. Five or six candidates for the vacancy thus caused have come forward, amongst whom are Prof. R. H. Smith, the present Professor of Civil and Mechanical Engineering in the Mason College, Birmingham; Prof. Barr, of the Technical College, Leeds; Mr. W. J. Millar, C.E., Glasgow, secretary to the Institute of Engineers and Shipbuilders in Scotland; and Mr. Henry Dyer, C.E., late principal of the Imperial College of Engineering, Japan.

The Atlantic greyhounds, new and old, Clyde built and otherwise, are now in the thick of a keen contest as to speed, and the partisans of Clyde-design and workmanship have little cause to feel alarmed at the results so far. The Inman and International Co.'s steamer *City of Paris*, built by Messrs. J. & G. Thomson, Clydebank, arrived at Liverpool on the morning of the 14th August, after completing the fastest passage on record from New York to Queenstown. The actual time occupied by the *City of Paris* in the voyage from New York to Queenstown was 5 days 23 hours and 38 minutes. She has previously performed the voyage outwards under six days, but the present voyage is the first occasion on which the trip homewards has been done under six days. Great interest was felt as to the result of the ocean race between the *City of New York* and the *Teutonic*, both of which left Queenstown about the same time on the 7th August, the *City of New York* leaving 25 minutes ahead of the *Teutonic*. The race was decided on the morning of the 15th August, when the *City of New York* passed Sandy Hook, her rival following 33 minutes later. Both were far from beating the best record of the *City of Paris* above noted. The time of the *City of New York* was 6 days 14 hours, and that of the *Teutonic*, 6 days, 14 hours, 20 min. but the distance run by the *City of New York* was ten miles longer than her rival. It must not be forgotten, however, that the *Teutonic* was making her maiden voyage, and made the fastest first trip. Of the succeeding homeward run of these fine vessels a New York telegram says: "The Ocean liners are off again in a neck-and-neck dash for Erin's shores. The *City of New York* left quarantine at 2.55 p.m. yesterday, and crossed the bar at 3.31. The *Teutonic* followed at 3.10 and 4.10 respectively. Both captains indignantly disclaim any intention of racing, but the vessels were groomed as carefully as the Derby candidates, and every bucket of coal taken aboard was closely inspected."

prised in the district of the Tyne. On Wednesday, Aug. 21st, they completed their inspection, and on that day had an opportunity of going over the great works of Messrs. C. M. Palmer & Co. The distinguished visitors, who were conducted through the works by Mr. Price, the general manager, accompanied by the heads of the principal departments, were greatly impressed by the huge bar mill which has just been newly started, and which, it is understood, is the most completely furnished and generally most effective bar rolling mill in the country. The visitors had also the satisfaction to inspect the steel furnaces, two of which are said to be among the largest in existence, their capacity of output being about 50 tons per day. In passing through the engine department it was noticed that the plant consisted largely of improved machine tools recently acquired for the twofold purpose of accelerating the progress of work and allowing the heavy masses of material that are now being used in engine construction, to be manipulated with less liability to accident. It was found that 28 sets of engines of large power were in progress (four of them being intended for cruisers of the second-class), besides several sets of a smaller type for torpedo boats. The blast furnaces also came in for a share of notice, and their presence reminded the visitors of the interesting fact that Messrs. Palmer's is the only establishment in the world where the whole of the processes connected with the construction of engines, boilers, and ships, from the smelting of the ore to the putting on of the finishing touches can be effectually carried out. In the two shipyards belonging to the firm, 16 vessels are on the stocks or in preparatory stages, and in addition to this vast amount of new work, the slipway and graving docks are occupied with vessels undergoing repair. It may here be stated that the three cruisers which the firm have been commissioned to build by the Admiralty are to be laid down at the Howdon yard. The earlier stages of the work in connection with these vessels has already been commenced, and the plans are being actively worked at. The firm have taken no orders for merchant steamers lately, but while we are not in a position to speak authoritatively on the subject, we are disposed to think that this may be attributed more to a disinclination to add to existing responsibilities, than to any lack of opportunities for doing so. When the Visiting Committee had concluded the inspection, they were entertained to luncheon in the board-room, Mr. Price presiding. In proposing the health of the Chairman of Lloyd's Registry, the last-named gentleman cordially endorsed the recently-expressed opinion of Mr. Arthur Coots (of Messrs. Hawthorn, Leslie & Co.) that the eminence and permanence of the Registry was to be attributed to the fact that the rules were the outcome of experience. He also paid a handsome tribute to the ability of the staff, and added as the expression of his own belief, that the success of the Registry was in no small degree assisted by the hearty co-operation of those who, like himself, were its clients. Mr. Price also referred with regret to the enforced absence on that occasion of Sir C. M. Palmer, M.P., the chairman of the company, to whom nothing would have given greater pleasure than to have been present to welcome Lloyd's Committee. After luncheon, the committee travelled by special train to Newcastle, whence they departed by the afternoon express for Scotland. Messrs. Armstrong, Mitchell & Co. have recently launched from their Low Walker yard an oil-carrying steamer of large tonnage, named the *Kura*, which has been built to the order of Newcastle owners, and the whole of the berths (nine in number) at that establishment are now occupied with vessels, nearly all of which are for the oil trade. At the Elswick yard the greatest activity exists, cruisers and other types of war vessels being laid down in almost every berth. Messrs. Hawthorn, Leslie & Co. have a very handsomely finished passenger vessel, which has been built to the order of foreign owners, nearly ready for launching, and the first of two war sloops, ordered some time ago by the Admiralty, is plated. There are several other vessels on the stocks, some of which are of exceptionally large tonnage, and great briskness continues to exist throughout the establishment. Messrs. R. Stephenson & Co. have been successful in obtaining an order from the Admiralty for one of the 17 second-class cruisers lately given out, and they have also some other important contracts in hand. The establishments of Messrs. C. S. Swan, Hunter & Co., Messrs. Schlesinger, Davis & Co., and Messrs. W. Richardson & Co., show fully sustained activity; and at the Tyne Shipbuilding Co.'s yard the keels for two large vessels have just been laid. In reference to the other yards, it need only be said that all are well supplied with work. The Sunderland steamer *Triumph*, which was sunk by

## TRADE NOTES FROM THE TYNE, WEAR, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—The Visiting Committee of Lloyd's Registry have been making a tour of the north-east coast during the month, and have, as a matter of course, given special attention to the important shipbuilding and engineering centre, com-

collision at the mouth of the river several months ago has, after a great many fruitless attempts, been at length successfully raised, and has been brought to the works of the Wallsend Pontoon Co., where it is understood she is to be thoroughly overhauled and repaired. The new graving dock of the Commercial Dry Dock Co., Limited, at Jarrow, which has been several years in course of construction, was formally opened on August 21st. The dock is 350 ft. long, 60 ft. wide at entrance, and has a depth of water of 21 ft. on the sill. From these particulars it will be seen that the dock will be capable of receiving vessels of a very large class; and as the company have equipped their works with modern plant of the best description for executing repair work to steamships and their machinery, it may reasonably be expected that the enterprise will prove a success.

**Engineering.**—It is understood that Messrs. Hawthorn, Leslie & Co. have been commissioned by the Admiralty to construct the engines and boilers for a number of the cruisers that have lately been ordered from private firms in different parts of the country. The work hitherto done for the Admiralty by this eminent firm has given great satisfaction and it is therefore not surprising that it should have been selected to supply a part of the machinery required for the new cruisers. At the Neptune Engine Works, Low Walker, several sets of engines of special design and great power, are in progress, and at the Wallsend Slipway Engine Works, there are some important repair contracts, to supplement the large amount of new work in hand. Messrs. Black & Hawthorn, and Messrs. Stephenson, have each engaged vessels during the month, and Messrs. Readhead are just now putting the machinery in a large vessel recently launched from their yard. The trial of the *s.s. Peace*, which was engaged by Messrs. Ernest Scott & Co., and provided with boilers to work up to a pressure of 160 lbs. by the Tyne Boiler Works Co., Limited, took place early in the month, and proved more than ordinarily successful. It may be stated that the boilers, which are 12 ft. 6 in. in diameter, are fitted with Fox's patent flues. The Tyne Boiler Works Co. have now another order in hand for Messrs. E. Scott & Co., and have also an order for a boiler 12 ft. in diameter by 10 ft. long, from Sir W. G. Armstrong, Mitchell & Co. Both of these are to work up to 160 lbs. pressure, are to be supplied with Purves' patent flues, and will be completed in September. The company are also engaged in carrying out extensive repairs to the hull and engines of the *s.s. Tweed*, and in substituting for the single boiler of 15 ft. 6 in. diameter, and 80 lbs. pressure which hitherto did duty, two smaller boilers of 10 ft. 6 in. diameter, and 60 lbs. pressure. In addition to the foregoing, the company have several donkey boilers of the ordinary marine type, about 8 ft. diameter by 8 ft. in length, in course of construction. This description of boiler—of which the company now make a great many—is coming increasingly into favour, the vertical boilers being usually found quite inadequate to the work required of them. Of the different kinds of patent boilers now manufactured, none are said to meet with such approval as the ordinary marine type of multitubular boiler, which, we are informed, is the only type now in use in sea-going steamers. Those works that are devoted to the manufacture of windlasses, steering gears, winches, and other steamship accessories, continue to show great activity, and anchor manufacturers, who are just now as busy as possible, continue to book orders for delivery at a late period of next year. It may here be stated that the plant and machinery of the well-known firm of Hawks, Crawshaw & Sons, were offered for sale on the 20th Aug. and subsequent days. Mr. Thomas Boydell, who started business only a few months ago, as a manufacturer of engine-room telegraphs, &c., at 27, Bath Lane, Newcastle, has been very successful in obtaining orders, and has now a good deal of work in hand. Among other orders just received is one from Messrs. Armstrong, Mitchell & Co. for a steering telegraph to be fitted on the *s.s. Kura*, with hand reply and rudder-head tell-tale. He has also orders in hand from the Tyne Shipbuilding Co., Messrs. William Allan & Co., Scotia Engine Works, Sunderland, the Wallsend Slipway and Engineering Co., and others. Messrs. Holzapfel's paint and composition works, Gateshead, are kept very busy just now, the demand for their specialities being very active.

#### THE WEAR.

**Shipbuilding.**—According to the opinion of Mr. J. Y. Short, the head of the well-known firm of Short Brothers, shipbuilders and timber merchants, the present prosperity of the ship-

building industry is likely to last for a very much longer period than is generally assigned to it among commercial men. Mr. Short, whose position and character give weight to his opinion, points to the fact that the old types of tonnage have to be replaced by vessels of modern design, propelled by modern machinery, and he asserts that this transition process cannot be completely carried out in less than seven years. There are, in Mr. Short's view, other potent influences at work to keep trade moving for some years to come, and whoever may look to the future in a doubting spirit, it is evident that he is not of the number. In the yard under Mr. Short's own control, there is an abundance of work, and appearances indicate the continuance of this state of matters for at least another year. Messrs. R. Thompson & Sons have recently been commissioned to build a vessel of special design to be employed in the laying of telegraph cables, and its construction has already been commenced. Nearly three years ago the *Citta di Milano*, ordered by Messrs. Spirello, of Spezzia, was launched by the same builders, and has since been employed with remarkable success in the work of laying cables. In the construction of that vessel the firm and their responsible officials bestowed the most minute care on the working out of every detail, and it is no doubt owing to the reputation deservedly achieved by the building of that and other vessels of a special class, that the present order for a cable ship has been entrusted to them. The firm some time ago put down a powerful hydraulic plate-bending machine, manufactured for them by Messrs. Hugh Smith & Co., Glasgow. The keel-plates for several vessels have been bent by it without having been heated, but it is only lately that the firm have commenced to utilise it in flanging the tops of floor-plates, so as to dispense with the presence of angle bars. The forming of the rectangular flange on floor-plates, brackets, &c., which is easily and quickly done by this machine, is a most important step in the direction of economical production, as it not only lessens the weight of material to be used, but also largely minimises the quantity of rivetting, caulking, and other work of a laborious description to be done. The British India Co.'s steamer *Mombassa*, which was launched early in March, has at length been removed from the vicinity of Mr. Laing's yard, where the work of completing the fittings of the interior has been carried out, and has been passed through the enlarged entrance of the South Dock, the formal opening of which was reserved for the occasion. The vessel has received her crew, which is mostly composed of Lascars, and will shortly leave the port to be placed upon her regular station. It has been decided, however, to give the public an opportunity of viewing her elaborately-finished interior before she leaves, for which privilege a small charge will be made, for the benefit of a local charity. Messrs. J. L. Thompson & Sons have nearly ready for launching a large steamer which is intended for the Australian wool trade, and the general briskness of the establishment is fully maintained. The Sunderland Shipbuilding Co., whose yard is still among the busiest in the district, have just ordered from Messrs. Hugh Smith & Co., of Glasgow, two of their improved counter-sinking machines. Messrs. Austin have, in addition to the new work on the stocks, several steamers undergoing extensive repairs. In the whole of the other yards activity is still the feature.

**Engineering.**—The North-Eastern Engineering Co., having just completed the engineering of a large steamer built to the order of German owners by the Sunderland Shipbuilding Co., are now busy with extensive repairs to the engines of the French steamer *Chateau Leoville*, which has been purchased by a local shipowning firm to replace one of their steamers recently lost. The company are also supplying the vessel with new boilers. The carrying capacity of the vessel, which is already very considerable, is to be increased by adding to her height above the water line, and this important alteration, together with a complete renewal of the decks, is to be carried out by Mr. James Laing. At the Palmers' Hill Engine Works some exceptionally large vessels have received their machinery during the month, and great activity continues to exist in the shops. Castings of the heavier kind are now beginning to be delivered from the new foundry recently started at Monk Street, and it is believed that in future little inconvenience will be felt at these works through the difficulty of procuring adequate supplies of forge and foundry products. The other marine engine works in the district continue actively employed. Manufacturers of steam winches and steering gear are still having an abundance of work, and tank makers are very busy. Much has been done within the past few weeks to put the Wear Steel Co.'s Works (formerly the Castletown Iron Works) in a

condition for commencing operations, and the fact that plate-rollers, shearers, heaters, and stock-takers are now being advertised for, shows that an early start is contemplated. The Monkwearmouth Iron Works is still kept going briskly, the patented specialities of Messrs. Bell & Rockcliffe being in great demand. The taper packing manufactured at these works is largely used in shipbuilding, and the weekly output of the community is now very considerable.

**The Hartlepool.**—Shipbuilding at this centre is still in the flood tide of prosperity, and it is indicative of the flourishing condition of the port that a very large proportion of the orders in the hands of the builders have come from local ship-owning firms. The kindred industry of marine engineering is also in full activity, a circumstance which is not surprising, seeing that many vessels come from other ports to be engaged in addition to those that are built in local yards. Since our last report the following ships, engaged by Messrs. Thomas Richardson & Sons, have had successful trials:—The s.s. *Ebro*, on August 14th. This vessel has been built to the order of Messrs. Thomas Wilson & Co., of Hull, and has been superintended by Mr. Spear. The s.s. *Hibernia* on August 16th. The hull and engines of this vessel have been built under the personal superintendence of Captain Smith, of Whitby and Cardiff, for the International Line, Whitby. The s.s. *Daylight* on August 17th, owned by Messrs. J. Wood & Co., of West Hartlepool. The s.s. *Dalmally* on August 18th, owned by Messrs. George Horsley & Co., West Hartlepool. During the same interval the following ships have received their machinery at Messrs. Richardson's sheerlegs:—The s.s. *Inchmarlo*, built by Messrs. R. Thompson & Sons, Sunderland, for Messrs. Hamilton, Fraser & Co., fitted with triple-expansion engines, with cylinders 25 in., 40 in., 68 in. diameter, by 3 ft. 6 in. stroke, and two large double-ended boilers, suitable for 160 lbs. working pressure. The s.s. *Florence*, for Messrs. James Westoll & Co., Sunderland, built by Messrs. Short Brothers, fitted with triple engines, having cylinder: 22 in., 35 in., 59 in. diameter, by 3 ft. 3 in. stroke, and two large single-ended boilers, suitable for a working pressure of 160 lbs. Work at the Central Marine Engine Works appears to be as plentiful as ever, all the departments being actively employed, the double shift system still being practised. During the month several fine steamers have been engaged, and the full complement for a month's work have been sent to sea. That the facilities provided at the Central Engine Works for the rapid dispatch of work, are capable of coping with the exceptional demand at present being made upon marine engineers, is fully evidenced by the fact elsewhere recorded, that the machinery and boilers of the s.s. *Ermanarich* were shipped on board at the works, satisfactorily tried under steam, and returned to the shipyard in less than three days from the time she was received at the sheerlegs. We have, however, a still more interesting fact to report in connection with the shipyard and engine works owned by Messrs. W. Gray & Co, viz.—the departure from the ordinary routine of cargo boats, into the more interesting sphere of passenger traffic, with its attendant finer line steamers, higher power engines, and quicker speeds. The trial trip of the s.s. *Empress*, respecting which full particulars will be found in another column, proves that Messrs. W. Gray & Co. have scored as complete a success with the passenger liner for the West Hartlepool Steam Navigation Co.'s Hamburg line, as they do every week of the year with cargo boats. The engines were run at the high piston speed of 650 ft. per minute for many hours on the trip without any trouble, and without any accumulation of water on the bearings. The propeller is of the special type, manufactured as a trade speciality at the Central Engine Works, and together with the rest of the machinery, has given the highest satisfaction. So great a success will doubtless speedily bring orders for more passenger steamers into the hands of this enterprising company. A new 12 H.P. gas engine, by Crossley Brothers, has just been supplied to the Lion Brewery, and is intended to drive the dynamo for an electric lighting installation, as well as the general machinery of the establishment. The timber trade of the port is just now exceedingly active, and labour is somewhat scarce.

**Stockton.**—At the four Stockton shipbuilding yards, there are now on the stocks fifteen vessels, representing an aggregate approximate carrying capacity of over 35,000 tons. Several other vessels are being fitted out beside the different yards, all of which are grouped within a comparatively limited area, and the aspect of the place is on the whole, one of quite unusual activity. The marine engine works of Messrs. Blair & Co., continue extremely busy, and there is also much activity in the

electric lighting department, added some time ago by the firm. The following vessels, engaged by the firm have had their trial trips lately:—The s.s. *Aisleby*, built by Messrs. Ropner & Son for Messrs. Ropner & Co., of West Hartlepool, having engines of 210 H.P. nominal, with cylinders 23 in., 38 in. and 62½ in. by 42 in. stroke. The s.s. *Haldon*, built by Messrs. E. Withey & Co., West Hartlepool, for Messrs. John Holman & Sons of London, having engines of 120 H.P. nominal, with cylinders 18½ in., 30 in., and 48 in. by 36 in. stroke. The *Ironopolis*, built by Messrs. Raylton, Dixon & Co., Middlesbro', for J. M. Lennard, Esq., having engines of 180 H.P., with cylinders 22½ in., 36½ in., and 60 in. by 39 in. stroke. The s.s. *Iltyd*, built by Messrs. Turnbull & Son, of Whitby, for Messrs. Turnbull Brothers, of Cardiff, having engines of 140 H.P. with cylinders 20 in., 33 in., and 54 in. by 36 in. stroke. The s.s. *Gloucester City*, built by Messrs. J. L. Thompson & Sons, Sunderland, for Messrs. Charles Hill & Sons, Bristol, having engines of 185 H.P. with cylinders 22½ in., 37 in., and 61 in. by 39 in. stroke. The engines for the whole of these vessels are constructed to work at 160 lbs. pressure of steam, and on the trials gave complete satisfaction. The firm are at present engaged in fitting complete electric lighting installations on the s.s. *Gulf of Aden* and the s.s. *Gulf of Venice*, both which vessels belong to the fleet of the Greenock Steam Shipping Co. These two vessels will bring the total number fitted with installations by Messrs. Blair for the same company, up to eight. Most of the other engineering works at this centre, continue busy.

**Middlesbro.**—The shipbuilding yards are still full of work, the vessels on the stocks at Messrs. Dixon & Co.'s establishment being mostly of a heavy class. In the engineering and iron-founding works, business continues brisk, and steel manufacturers are well supplied with orders. Local iron works are generally doing an improved trade.

**Darlington.**—During the last month the Darlington Forge Co. have sent out, among other heavy steel and iron forgings and castings, two large cast-steel rudders for Middlesbro, and a cast-steel stern-frame weighing about 11 tons, for the Wear. This frame is one of three duplicates for the same firm, and the manufacture of the remaining two is now being actively proceeded with. The company have also sent out some very heavy castings for rolling mills, &c., and from the forge department several large crank shafts, and thrust shafts, both in iron and steel, among which may be mentioned one single crank shaft for Rotterdam weighing 10½ tons, and two thrust shafts weighing about 11 tons each; also many stern frames and rudders, some of which have gone to Antwerp and Hamburg, for well-known shipbuilding firms.

## THE MERSEY.

**M**OST of the engineering shops and shipbuilding yards are still very busy, many important orders having been booked within the last few weeks, and most works are working overtime. The traffic on the landing stages to the ferries and to the various watering places has been enormous, notwithstanding the unsettled weather. A very important scheme is reported from America as being under the consideration of Mr. Austin Corbin, a successful railway magnate in America, in conjunction with Mr. Jay Gould and Mr. Cyrus Field, for establishing a new line of American steamers, to be called the "Rapid Transit Steamship Co." If the scheme is realised to the extent anticipated, it will materially affect the Atlantic trade of the Liverpool companies, for it is proposed to build eight steamers at an average cost of £300,000 each; they are to be larger than any present steamer, and are to beat any previous record of steaming. The intention is to shorten the journey across the Atlantic, by running the steamers from Montauk Point, at the extreme east end of Long Island, and fully 100 miles to the east of New York. It is not definitely decided whether to run the steamers to Liverpool or to Milford Haven. The American landing place will necessitate the construction of large docks and other accommodation at Montauk Point, and it is proposed to run the train carrying the passengers on to a barge, and so take them to the heart of the city of New York. The Canadian mail contract, which Messrs. J. & A. Allan have held for over 30 years, has now gone to Messrs. Anderson, Anderson & Co., of London. Various rumours, which have been current for some time, having found expression in a Liverpool daily paper, the agents of the Inman Line, Messrs. Richardson, Spence & Co., have written to the *Liverpool Post* denying the truth of the statement that the *City*

of *New York* was about to be returned to the builders unless she ranks as a five-day boat. Messrs. Richardson say that they are entirely satisfied with the ship, and that they believe the sister ships, the *City of New York* and the *City of Paris*, to be the finest passenger ships afloat—unsinkable twin screws, with large power, and very special accommodation for passengers. The question of a trifling difference in speed between these vessels, and between them and a few of their rivals, is not, they say, matter of much moment to them, the other good qualities of the vessels amply justifying public confidence in them. It is to be hoped that this statement will set at rest many vague and quite unwarranted statements which were being freely made concerning especially the *City of New York*. In connection with this, it may be noted that the *City of Paris*, on her last voyage from New York to Queenstown, made the passage in 5 days, 23 hours, and 38 minutes. This beats the record for the homeward trip.

### WELSH NOTES.

**T**INPLATE makers are a peculiar class. It is the most difficult thing in the world for a new man to do a trade with them. One might think they were being asked to quote prices for so many drops of their precious blood, than for so many boxes of tinplates. If you secure a quotation, however, it does not necessarily follow that the price named is the price which will be accepted, for approach the seller with the money in one hand, an order in the other, and it is wonderful how their ideas change. This weakness of some makers is one of the reasons why the trade can make no determined stand for an advance of prices. Another bad feature of tinplate makers is their excessive pigheadedness. If a broker applies to the Morriston maker, for example, for a price, a quotation is made, less 3 per cent. Told that other makers allow 1 per cent. brokerage to the middleman, they reply, "Yes, yes; but we can't do that, look oo!" Then the broker, if he be a sensible man, does "look oo," and, if he can, leaves the Morriston makers alone. The writer of these pages was once struck with the happy thought of doing a tinplate business, but when he found his hair getting thin at the top and his whiskers become grey, he gave up the attempt. Life was too short, and wigs and hair dye too expensive, so he left the tinplate men to continue selling their plates to merchants in Liverpool and London who sell to the buyers. In this trade one finds that the makers have the knowledge and experience; the middlemen make the money. When tinplate makers become sensible and deal direct with the consumer—as they could if they tried properly—we shall see the trade in a very much better position. If the makers could only see it, they would find the present an excellent opportunity for making a start. Buyers, that is the middlemen, will not spring in price; makers will not take other prices, as raw material is going up, and so the trade hangs. If the makers are wise, they would send their travellers out now, and cut out the middlemen, but they have not the energy to do so.

True, one firm is doing it, and their name is Wm. Gilbertson & Sons, Limited, of Pontardawe; but then they are by no means typical tinplate makers: you could find no nicer people to do with in any trade, hence we find it difficult to believe that nature ever intended them for the trade with which their name is associated. There they are, however, and they show the other manufacturers how trade should be done. But the other makers are wise in their own conceits, and will see nothing. Especially is this the case since they declined to listen to the voice of those charmers, Fowler & Co., who tried to float the tinplate syndicate. The truth of the matter is, there is a lot of profit in tinplates just now; the makers know it—but what they don't know is how to get it out. Messrs. Fowler & Co. appeared to have some idea of the process; but it was no good. The makers determined to keep their trade to themselves, with the result that prices are now absurdly low.

The new Barry Dock is not calculated to give shipowners a great idea of the safety of its entrance. Several vessels have collided at the dock bar, and it is now said that the directors have decided to erect a breakwater to protect the entrance. Some such course as this is very necessary, and the experience of the last few weeks shows the necessity for this breakwater; shows that those witnesses who objected to the size of the new dock when the Barry Bill was in Committee spoke words of truth.

Another piece of news about the Barry undertaking is that the critics say the concern will never do enough trade to pay anything like a decent dividend on the ordinary shares. These critics are, however, all in the Bute camp, so too much attention should not be paid to anything they may say detrimental to the new dock.

The new Vale of Glamorgan Railway is to be worked by the Barry Co. The new line runs from Bridgend to Barry, through a portion of Glamorgan hitherto possessing no railway accommodation. It has been promoted by North's Navigation Collieries Co. chiefly for the purpose of providing a means of communication between collieries in the valleys above Bridgend and Barry. The new line will consist at the beginning of a single line of rails, and the agreement for the working of the concern provides that 60 per cent. of the receipts shall be taken by the Barry Co., the remaining 40 going to the shareholders in the new line.

The Mumbles Railway and Pier Bill has been passed, so that promoters are now in a position to go on with a scheme which can be made a good thing if properly worked. The scheme is to construct a pier at Mumbles, a small watering place on the shores of Swansea Bay, and to connect it with the present Mumbles terminus of the Mumbles and Swansea Railway. It is expected that a trade will be secured in passengers and goods between the Devonshire Coast and Swansea Bay, and there are some sanguine mortals who talk about a bunkering trade being done at the new pier. The rates on the coals from Swansea to the pier will, however, effectually stop anything much being done in this way. At present the scheme is neither one thing nor the other; not good enough for business, and too bad for pleasure will be any such pier as the one which, we understand, is in contemplation.

In the Annual Trade Return for 1888, which has just been issued, Cardiff has been recognised as an importing port, and is the only one in Wales so honoured. This is not due to any agitation on the part of the Cardiffraies, but the officials who compile these returns seem to have decided in their wisdom that Cardiff, being such an important port in exports, should be honoured in its imports. As a matter of fact, Swansea exceeds Cardiff in imports, and should be officially recognised. It affords satisfaction, however, to find that any Welsh port has been put on the list. People away from Wales possess, apparently, a very dim notion of what important places are to be found in Wales.

A writer in a South Wales daily has lately been drawing attention to the fact that the London market is practically neglected by the owners of Welsh house coal collieries. True, a rather large quantity of coal is sent annually from South Wales to London, but it is chiefly steam coal, for steamers and locomotives. A quantity of good house coal is raised in Wales, and there is no reason in the world why a share of London's orders should not come to this market.

Messrs. Fowler & Co., of Westminster, who engineered the Salt Syndicate, are trying to form a ring in anthracite coal, and it is to be hoped that their endeavours will prove successful. At present the anthracite trade is looking better than has ever before been the case. The coal is becoming more widely appreciated, and a considerable rise in price has recently been experienced for some qualities; but for all this it cannot be said that the majority of anthracite coalowners are doing more than make ends meet. The total annual output is not much, if any more than 800,000 tons, and all this is drawn from one corner of South Wales. If the thirty collieries or so producing this were in the hands of a strong syndicate, the price could easily be put up 1s. 6d. per ton, with the result that money would be made instead of lost, as at present.

A very valuable article has been contributed to a Swansea paper by a gentleman well known in the tinplate trade, on the practicability of tinplates being made successfully and profitably in the United States. The result he comes to is, that whilst it is quite possible to make the plates in the States, the cost would be so heavy as to permit of Welsh-made plates successfully competing, even with the increased tariff it has been proposed should be put upon imported plates. In thus talking of making tinplates the Yankees appear to forget that skilled labour is required, and that the steel necessary is very different to the qualities now turned out from American works. In estimating their cost, Americans seem to think they can use the same steel as they use for rails, &c. They were never more mistaken.

A well-known Newport man, in the person of Mr. James Brown, has gone over to the majority during the past month.

Years ago Mr. Brown occupied an important position in connection with Monmouthshire industry, but misfortunes overtook him, and for a considerable time prior to his death he was in very reduced circumstances. Mr. Brown secured a good deal of notoriety in connection with numerous actions he brought against the Great Western Railway Co., all of which were for the public good. If a few more men would come forward as Mr. Brown did, and keep the various railways in this district up to the mark, it would do a vast amount of good.

A return has been issued showing the exports of tinplates for July. Compared to July, 1888, the trade shows a falling off, but for the first seven months of the year a considerable increase is apparent. The July, 1888, figures are 31,844 tons, value £445,055; July, 1889, 36,837 tons, value £507,369.

Those people who prophesied disaster for North's Navigation Collieries Co., Limited, will feel somewhat unwell just now, we should imagine. The concern has just paid 10 per cent. dividend, and there is no reason why this sort of thing should not continue. We regret to find, however, that the company proposes continuing the manufacture of iron. This trade cannot be successfully carried on at such a distance from the seaboard as are the Llynir Works.

The Rhondda and Swansea Bay Railway Co.'s annual meeting has just been held, and a dividend of 1½ per cent. paid to the ordinary shareholders out of earnings, although the chief part of the line is not yet open for traffic. It is expected that the entire length of the line will be open by November. The directors have made arrangements for the erection of coal tips on the most approved principle at East Dock, Swansea, but they have delayed this course too long. In all probability the line will be opened before the necessary tipping accommodation is ready.

Coal prices here are well maintained, and trading recently has been so profitable that several collieries are in the market, the owners apparently being desirous of securing the improved price a profitable year's working should secure for them.

Tinplate prices are rather improved towards the end of the month, but are not yet what they should be.

Freights also show an improvement, especially for Baltic, Cronstadt rates showing a rise of about two shillings in the month.

## BELFAST TRADE NOTES.

THE shipbuilding and engineering trade is, we are pleased to say, still very busy, and with every prospect of continuing so, all the works being fully employed.

Messrs. Harland & Wolff, Queen's Island, are rapidly pushing forward the fitting out of the majestic sister ship to the *Teutonic*, and we understand that she will have two more boilers than the *Teutonic*. They are also busy with a fine new steamer, the *Yorkshire*, putting her machinery in. She is built to the order of Messrs. Bibby Bros. & Co., Liverpool. A sister ship, the s.s. *Lancashire*, left here for Liverpool on 10th August for the same owners.

Messrs. Harland & Wolff have two fine screw steamers, the *Amer* and *Gaekwar*, almost ready for launching.

It is needless to say that the performance of the *Teutonic* has been watched with the greatest interest in Belfast, and her very successive maiden trip across the Atlantic has been a source of satisfaction to the people of this city, who feel a kind of pride in the celebrated shipbuilding yard situated on their river.

Sir E. J. Harland, Bart., M.P., has been returned unopposed for North Belfast to Parliament, and his opinions as a thoroughly practical engineer and shipbuilder must be welcome on any point concerning the shipping interests that may arise in Parliament. In politics he is a Conservative.

Messrs. McIlwaine & Maccoll, Limited, have a fine steamer pretty well advanced, and are now giving the finishing touches to the s.s. *Adula*, launched by them during July to the order of Messrs. Leach, Harrison & Forwood, of Liverpool, and she will be ready for sea in a few days. They are also busy with the s.s. *Andes*, receiving new boilers and engines, being compounded. This is a sister ship to the s.s. *Alps*, which they had in hand early in the year.

Messrs. Workman, Clark & Co., Limited, are also busy, and will have some launches shortly. The s.s. *Uranus*, built by them to the order of Messrs. Coates & Carver, Manchester, has been towed to Glasgow to receive her machinery at the hands of Messrs. Muir & Houston.

The Antrim Iron Ore Co., Limited, are placing two of their fine steamers on the East Coast of England and Belfast trade. This trade of late years has grown to considerable proportions, and in the hands of the above company a further improvement may be expected.

The new 100-ton derrick crane is being erected and the new graving dock, and for the very large steamers now being turned out here will doubtless prove a great improvement on the shearlegs.

The new floating dock, which we mentioned in our February notes, has now been commenced by the contractors, and their machinery and plant is being placed in position. This dock is between the Albert Quay and the Dufferin Floating Dock, and has for many years been a timber pond where the tide flowed and ebbed, and is therefore considerably excavated. It is intended for vessels of the largest draught of water.

## LEITH NOTES.

NOTHING of particular interest has occurred in shipbuilding circles this month. The only new order yet placed is one with Messrs. Hawthorns & Co. for two sets of air-compressing machinery, one for Corsewall and one for Ayre Point Light-house.

There have been two launches here this month, one from Messrs. Ramage & Ferguson's yard and one from Messrs. S. & H. Morton's yard. These two firms have enough work on hand to ensure a busy winter. Messrs. Hawthorns & Co. have the s.s. *Stettin*, one of Messrs. J. Currie & Co.'s steamers, alongside their wharf, undergoing extensive repairs in the shape of a new boiler and a new cylinder, to convert the present compound engines into triple-expansion. Messrs. Hawthorns & Co. are also busy on a fine set of triple-expansion engines for the new steamer *Scotland*, launched by the Grangemouth Dockyard Co. some time ago. Messrs. Cran & Co., Albert Engine Works, have a fair share of repair work on hand.

**PNEUMATIC RIVETTING.**—The pneumatic system of rivetting, as introduced by Messrs. De Bergue & Co., of Manchester, is evidently making headway in Scotland. Early in the present year a complete plant of this description was put down by Messrs. Napier, Shanks, & Bell, in their shipbuilding establishment near Glasgow, and now we are able to state that the Grangemouth Dockyard Shipbuilding Co., who some time ago furnished their Grangemouth establishment with a pneumatic plant from Messrs. De Bergue & Co., have ordered a second similar plant for the new yards they are establishing at Alloa. This circumstance is a significant testimony to the worth of the system; but it is by no means the only testimony, as most excellent accounts are heard respecting it from all quarters where it is in use.

**IMPORTANT WORK ON FUEL.**—Messrs. J. & A. Churchill hope to publish in September an important work on Fuel and its Applications, by Mr. E. J. Mills, F.R.S., and Mr. F. J. Rowan. It will be the first volume of a large work on Chemical Technology, of which Mr. C. E. Groves, F.R.S., will be the general editor, and which will be founded on one written by Richardson and Ronalds familiarly known as Knap's Technology. Messrs. Mills and Rowan's work on Fuel is in reality a new work, in which the applications of Fuel to Arts and Manufactures as introduced by the most modern discoveries is given to the scientific world. The volume is profusely illustrated.

**INSTITUTE OF MARINE ENGINEERS.**—The following is an excerpt from Syllabus of Papers to be read:—Mr. W. J. Craig, "Scientific Trinities" (specially for Junior Members); Mr. R. Bruce, "Radical Valve Gear;" Mr. Jos. Williams, "Forced Draught;" Mr. A. Beldam, "Progress and Development of the Marine Engine." Session begins Monday, Sept. 2nd.

**QUICK WORK AT WEST HARTLEPOOL.**—A remarkably quick piece of work is reported from this port. The s.s. *Ermanarich*, recently launched from the yard of Messrs. W. Gray & Co., Limited, was sent down to the Central Engine Works at three o'clock on the Wednesday afternoon. Her engines and boilers of 700 I.H.P. were put on board, the connections made, and they were successfully steamed for four hours, in the presence of the official and owners' inspectors, on Saturday morning, and the ship returned to the builders' yard by noon on Saturday, that is, in less than three working days from the time she left there.

**FAST PASSAGE FROM THE CAPE.**—The Union Steamship Co.'s Royal mail steamer *Mexican*, which left Cape Town at 5.30 p.m. on the 7th of August, arrived at Southampton at 10.15 a.m. on August 25th, her gross passage being 17 days, 16 hours, 45 minutes, and her nett steaming time 17 days, 12 hours, 45 minutes. The distance run was 5,985 miles, giving an average speed of 14.2 knots per hour over the whole course.

**MASTLESS OCEAN STEAMERS.**—Capt. Fred. Watkins, of the Inman Line steamer *City of Paris*, says that fore and aft canvas is of no assistance to a fast steamer, not even for steadying purposes. Instead of increasing the speed, he says, the spars and sails frequently retard them as much as a mile an hour. Within a few years he expects to note the absence of both canvas and spars from all the ocean fliers, and the same will undoubtedly be the case on the Great Lakes.

The Government have placed with the London and Glasgow Engineering and Iron Shipbuilding Co. an order for three sets of boilers and engines for the three cruisers of the *Apollo* class, which they recently contracted to build. Messrs. Thomson, of Clydebank, have just laid the keel of one of three cruisers for the British Government.

## LAUNCHES AND TRIAL TRIPS.

### LAUNCHES.—ENGLISH.

**Lingfield.**—On July 24th a steel screw steamer, named the *Lingfield*, built for Messrs. W. R. Price & Co., London, was launched from the shipbuilding yard of Messrs. C. S. Swan & Hunter, Wallsend-on-Tyne. The vessel is of the following dimensions:—Length over all, 300 ft.; breadth, 39 ft. 10 in.; depth moulded, 22 ft. 3 in. The vessel has been built under special survey, under the superintendence of Captain McIntyre, and will be classed 100 A 1 at Lloyd's. She is of the improved well-deck type, with full poop, long raised quarter-deck, long bridgehouse, and topgallant fore-castle, and is fitted for water ballast in a cellular double bottom all fore and aft. Improved steam winches, for the rapid loading and discharging of cargo, steam steering gear, and other appliances of the latest design and most modern improvements have been introduced. The engines are of the triple-expansion type, built by the Wallsend Slipway & Engineering Co., Limited, Wallsend, and are capable of indicating 1,200 H.P. On leaving the ways the vessel was named by Mrs. W. B. Pearson, of Ripon.

**Merrion.**—On July 27th, Messrs. R. Irvine & Co. launched from their yard at West Hartlepool a fine steel steamer, to the order of Messrs. Trechmann & Co., West Hartlepool. Her dimensions are:—Length over all, 275 ft.; breadth of beam, 37 ft. 2 in.; depth, 19 ft. 5 in.; with a carrying capacity of 2,800 tons. Her engines, of triple-expansion type, have a N.H.P. of 150, and will be supplied by Messrs. Blair & Co., of Stockton-on-Tees, and patent windlass by Emerson, Walker & Co., Limited. She was named *Merrion*, by Miss Trechmann, of West Hartlepool.

**King Alfred.**—On July 27th a fine steel screw cargo steamer, 225 ft. by 32 ft. 6 in. by 15 ft. 9 in., was launched from the works of the Blyth Shipbuilding Co. at Blyth. This vessel was named the *King Alfred*, and has been built for Mr. Owen C. Philipps, of Glasgow. The engines will be supplied by the North Eastern Engineering Co., of Wallsend, and are of the tri-compound kind, with cylinders 16½ in., 27 in. and 44 in. by 33 in. stroke, and boilers to work at an ordinary pressure of 160 lbs. The hull and machinery have been constructed under the inspection of Mr. James Dykes, superintendent engineer, of Newcastle-on-Tyne. The christening ceremony was performed by Miss Ida Hedley, daughter of Mr. Hedley, Mayfield, Gosforth. The Blyth Shipbuilding Co.'s building berths are all occupied at present, and the berth vacant by the launching of the *King Alfred* will be immediately filled. The company have also two new vessels at their outfitting quay both rapidly approaching completion. In addition they are executing repairs to several vessels in the river.

**Inchmarle.**—On Monday afternoon, July 29th, there was successfully launched from Messrs. R. Thompson & Sons' Southwick Yard, Sunderland, a steel screw steamer, built to the order of Messrs. Hamilton, Fraser & Co., Liverpool, and of the following dimensions:—Length over all, 332 ft.; breadth, 42 ft.; depth, moulded, 29 ft. Class 100 A 1, and constructed under the

three-deck rules, and fitted with cellular double bottom for water ballast. The vessel has been designed to carry a very large cargo on moderate draft of water, and is fitted with poop aft for the accommodation of officers, bridge amidships, over engines and boilers, to accommodate engineers, &c., with topgallant fore-castle for crew. The vessel has four very large hatches, with double derricks to each hatch; four powerful steam winches, and large multitubular boiler for working same; Maginnis' patent steam steering-gear, steam capstan, windlass, lighthouses, on fore-castle, and she is schooner rig. The engines, with cylinders 25 in., 40 in., and 68 in., by 42 in. stroke, with extra large double-ended boilers, are by Messrs. F. Richardson & Sons, Hartlepool. The vessel has been inspected during construction by Mr. J. B. Edmiston, superintendent for the company, and every latest improvement that he could suggest has been made. On leaving the ways she was named the *Inchmarle* by Miss Mildred Ball, of Torquay.

**Sobraon.**—On July 29th there was successfully launched from the shipbuilding yard of Messrs. William Pickersgill & Sons, Southwick, a steel spar-decked steamer with clipper stem, of the following dimensions:—Length over all, 300 ft.; breadth, extreme, 41 ft.; depth, moulded, 27 ft. 9 in. She is built to the order of Mr. F. Gordon, of Sunderland, to the highest classification of Lloyd's, having accommodation aft for captain and officers, the engineers being berthed in an iron house on the spar-deck amidships, and the crew forward. Water ballast is provided for fore and aft, on the cellular double bottom principle. The vessel is fitted with all the latest improvements. The engines will be supplied by Messrs. Black, Hawthorn & Co., of Gateshead, on the triple-expansion principle. This is the second vessel constructed by the builders for the same owner. As she left the ways she was named the *Sobraon* by Miss Gordon, sister of the owner.

**Roma.**—On July 29th, Messrs. Jos. L. Thompson & Sons, North Sands, Sunderland, launched the steel screw steamer *Roma*, built to the order of Messrs. Rowland & Marwood, of Whitby. This vessel is of the improved well-deck type, and is built on the cellular double bottom and web-frame principle, with longitudinal intercostal keelsons, and will carry 4,200 tons deadweight cargo on a light draught. The deck machinery includes direct steam windlass, four horizontal steam winches, steam steering gear amidships, and patent screw steering gear aft. The engines and boilers have been constructed by Mr. John Dickenson, Palmer's Hill, Sunderland.

**Elmville.**—On July 30th the fine steel screw steamer *Elmville*, built by Messrs. W. Gray & Co., Limited, for Messrs. R. Shadforth & Co., Sunderland, was launched. This vessel is the fifth built by Messrs. W. Gray & Co., Limited, for the same owners. She takes Lloyd's highest class, and will carry 2,700 tons deadweight, the dimensions being:—Length over all, 280 ft.; breadth, 37 ft.; depth, 20 ft. She has a poop containing a handsome saloon, state-rooms, and captain and officers rooms; long raised quarter-deck, long bridge up to fore hatch, and topgallant fore-castle. The crew are berthed in the fore end of the bridge, while the engineers' rooms are at the after part. The hull is built on the web frame system with double bottom under each hold, and the equipment will be of the most modern description, including steam winches, steam steering gear amidships, screw gear aft, large donkey boiler, Emerson, Walker & Co.'s patent windlass, shifting boards throughout, boats on beams, &c. First-class engines on the three cylinder triple-expansion principle, working on three cranks, are being supplied by the Central Marine Engine Works of W. Gray & Co., Limited, West Hartlepool; they will develop 800 H.P. A constant supply of steam at a working pressure of 150 lbs. per square inch will be maintained by fine large steel boilers. The christening ceremony was gracefully performed by Miss Shadforth, daughter of the owner. The hull and machinery of the *Elmville* have been built under the supervision of Captain T. W. Watson and Mr. Alfred Gray respectively on behalf of the owners.

**Santiago.**—On July 30th the Naval Construction and Armaments Co., Limited, launched from their shipbuilding yard at Barrow a handsomely modelled screw passenger steamer, named the *Santiago*, which has been built for the Pacific Steam Navigation Co., of Liverpool, for their South American coasting trade. The dimensions of the *Santiago* are: 350 ft. by 45 ft. by 31 ft. 9 in., moulded to upper deck. The hull is built entirely of steel, on the double bottom longitudinal principle; the whole of the material being supplied by the Barrow Hematite Steel Co. The engines are of the vertical triple-expansion

type, having cylinders 31 in., 49 in., and 78 in. diameter by 60-in. stroke, supplied with steam by two double-ended boilers 13 ft. 9 in. diameter by 18 ft. 6 in. long, and two single-ended boilers 13 ft. 9 in. diameter by 9 ft. 8 in. long, at a working pressure of 160 lbs. per square inch, and will indicate on trial about 3,500 I.H.P., giving a speed of about 14½ knots. A sister vessel for the Pacific Company is now in course of construction by the builders, and is nearly ready for launching.

**A Caisson.**—On Wednesday morning, July 31st, Messrs. E. Finch & Co., Limited, launched from their shipbuilding yard at Chepstow the second or intermediate caisson, built to the order of the Barry Graving Dock Co. The caisson was at once taken in tow by three tugs for Barry.

**Dahlia.**—On July 31st Messrs. Cochran, Cooper & Schofield launched from their shipyard at Grovehill, Hull, the fourth iron steamer built by them this year for the North Eastern Steam Fishing Co., Grimsby. Her dimensions are 100 ft. in length, 20 ft. 6 in. beam, and 11 ft. depth of hold, and she will be classed 100 A 1 at Lloyd's. She will be fitted with all the latest improvements for trawling, and also with powerful engines, by Messrs. C. D. Holmes & Co., of Hull. The steamer was named the *Dahlia* by Miss Baskcomb, daughter of the managing director of the company.

**Ainsdale.**—On July 31st Messrs. John Readhead & Sons launched from their shipbuilding yard, West Docks, South Shields, a large new steel screw steamer to the order of the firm of Pantland Hicks, jun., of Scarborough. The vessel is built on the latest improved well-deck system, having poop, long raised quarter-deck, bridge amidships, and topgallant fore-castle. She is also fitted with cellular bottom for water ballast. Her dimensions are: 290 ft. by 39 ft. by 30 ft. She has a deadweight capacity of 3,450 tons, and is fitted with all the appliances required by the Grain Cargoes Act. The machinery is also being constructed by Messrs. John Readhead & Sons, on the triple-expansion system, with cylinders 23 in., 37½ in., and 61½ in., and 39 in. stroke. Steam will be supplied from two large steel boilers, working at a pressure of 160 lbs. per square inch. The vessel and machinery will be classed 100 A 1 at Lloyd's, and was named the *Ainsdale* by Mrs. Pantland Hicks, jun., as she left the launching ways. This is the seventh vessel built by Messrs. J. Readhead & Sons for the firm of Pantland Hicks, jun.

**Polo.**—On August 1st the s.s. *Polo*, a steel ship, built to the order of Messrs. Thos. Wilson, Sons & Co. for their coasting trade, was launched by Messrs. Earle's Shipbuilding and Engineering Co., Limited, Hull. Her dimensions are 160 ft. by 25 ft. by 14 ft., with raised quarter-deck extending over engines and boiler, enclosed bridge amidships, and raised fore-castle. The captain and officers are berthed under the bridge, and the crew forward under the fore-castle. The hatches are designed in large size, and the steam winches, derricks, gangways, &c., are all arranged to afford facilities for rapid working of cargo. The vessel is schooner rigged with two pole masts. Her machinery is on the new quadruple compound system, with 4-cylinder engines, 12½ in., 18½ in., 27 in., and 39 in. diameter, by 24 in. stroke, supplied by a powerful steel boiler with steam of 200 lbs. working pressure.

**Syria.**—On Thursday afternoon, August 1st, Messrs. Raylton, Dixon & Co., Middlesbro', launched from their Cleveland Dockyard a fine steel screw steamer, which has been built to the order of Messrs. Bailey & Leatham, of Hull. The leading dimensions of this vessel are:—Length, 277 ft.; breadth, 38 ft.; depth, moulded, 21 ft. 9 in., with a deadweight capacity of over 3,000 tons; and she is fitted with raised quarter-deck, long bridge, short poop aft, topgallant fore-castle, and all the latest improvements for a cargo vessel of this description, including horizontal direct steam windlass, by Emerson, Walker & Co., Limited. Her engines will be supplied by Mr. George Clark, of Sunderland, of 170 nominal H.P., with cylinders 21 in., 34 in., and 56 in. by 39 in. stroke. On leaving the ways she was christened *Syria* by Miss Sallie Morley.

**Cambridge.**—On August 7th there was launched from the yard of Messrs. C. S. Swan & Hunter, Wallsend, a steel screw steamer of the following dimensions:—Length, 300 ft.; breadth, 39 ft. 10 in.; depth, moulded, 22 ft. 3 in. The vessel has been built under special survey, and classed 100 A 1 at Lloyd's. She is of the improved well-deck type, with long raised quarter-deck, long bridge-house extending well forward, and topgallant fore-castle. Water ballast is provided for in a double bottom all fore and aft, and also in the after peak. All modern im-

provements have been introduced in her construction. The Great Western Steamship Co., Limited, Bristol, are the owners, and Messrs. Mark Whitwill & Son, Bristol, the managers for the company. The engines, of the triple-expansion type, have been built by Messrs. Blair & Co., Stockton, and are capable of indicating 1,100 H.P. On leaving the ways the vessel was named the *Cambridge* by Miss Edith Whitwill.

**Burton.**—On Saturday, August 10th, there was launched from the Stockton yard of Messrs. R. Craggs & Sons the s.s. *Burton*, of the following dimensions:—195 ft. by 28 ft. 5 in. by 14 ft. 2½ in. moulded. She has been built to the order of Wm. F. Beaumont, Esq., of Boston, for his Boston and Hamburg line of steamers. The engines will be supplied by Messrs. Westgarth, English & Co., of Middlesborough, and have cylinders 16½ in., 26 in., and 44 in. by 33 in., with a large steel boiler, working pressure, 160 lbs. She is fitted with patent steam windlass, by Emerson Walker, & Co., Limited.

**Marcobrunner.**—On Saturday afternoon, August 10th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, the fifth steamer built by the firm for the Hansa Steamship Co., of Bremen. The length of the vessel is 323 ft.; breadth, 41 ft.; and depth of hold, 27 ft. 6 in. The steamer is built to the spar deck rule, and has large topgallant fore-castle to accommodate crew, firemen, &c., and long bridge amidships, in which is placed the saloon and accommodation for captain, officers, and a few first-class passengers. The vessel is constructed upon the web frame principle, thus dispensing with hold beams, and has cellular water ballast all fore and aft; all weather decks are of wood, and all frames of Z steel. Her class will be 100 A 1, Lloyd's special survey, and also the highest class in the German registry. The deck machinery consists of five large steam winches by Clarke, Chapman & Co., Harrison's steam steering gear, which is placed in the engine-room, and worked from the bridge; Harfield's patent direct steam windlass, Tyzack's patent anchors, and all the usual appliances for handling cargo and working the ship with the greatest possible despatch. The main engines are upon the tri-compound principle by the North Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 23½ in., 39 in., and 64 in. by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel during construction has been inspected on behalf of the owners by Mr. Wulff and Mr. Himer, and upon leaving the ways was gracefully named *Marcobrunner*, by Miss Swainston, after which she was towed into the South Dock to receive her machinery.

**Saragossa.**—On August 10th Messrs. William Dobson & Co. launched from their shipbuilding yard at Low Walker, a handsome steel screw steamer, built to the order of Messrs. Henry Scholefield & Son, of Newcastle. Her dimensions are:—Length, 275 ft.; breadth, 37 ft.; depth, 18 ft. 6 in. The vessel is constructed on the well-deck principle, and will be engaged by Messrs. Alley & McLellan, of Glasgow. On leaving the ways she was named the *Saragossa* by Miss Lizzie Jackson, of Jesmond. This is the second steamer that has been built for this firm by the builders this year, under the supervision of Mr. A. F. Stafford, the company's superintendent.

**Nellie Troop.**—On August 10th, Messrs. C. Hill & Sons, of Bristol and Cardiff, launched from their Albion yard a steel barque, built to the order of Messrs. Troop & Son, St. John's, New Brunswick. The vessel, which was named the *Nellie Troop*, is 237 ft. long and 36 ft. 2 in. broad. Her carrying capacity is 2,200 tons.

**Calliope.**—On Monday, August 12th, Messrs. W. Gray & Co., Limited, launched a fine screw steamer from their central shipyard. She is a vessel 324 ft. long over all by 40 ft. 6 in. beam and 21 ft. 11 in. depth of hold, having a deadweight capacity of 4,350 tons. She will class 100 A 1 at Lloyd's, and is to the order of Messrs. Gladstone & Cornforth, of West Hartlepool. The deck erections consist of a poop, long raised quarter-deck, long bridge and topgallant fore-castle. The saloon, state-rooms, and captain's and officers' rooms will be aft. The engineers' accommodation amidship, and that for the crew in the fore-part of the bridge. The hull is built with web frames, and double bottom for water ballast under each hold, and a full equipment will be provided, including steam winches, steam steering gear, screw gear aft, Emerson, Walker & Co.'s patent windlass, two donkey boilers, &c., and the Central Marine Engine Works of W. Gray & Co., Limited, supply the engines, which are of the triple-expansion type of 1,200 H.P., and two large steel boilers to work at a pressure of 160 lbs. per square

inch. She was gracefully christened *Calliope* by Miss Cornforth, daughter of one of the owners.

**Redcar.**—On August 12th Messrs. W. Gray & Co., Limited, launched two fine screw steamers. The second was the *Redcar*, built to order of Messrs. English & Co., of Middlesbrough. Her dimensions are:—Length over all, 270 ft.; breadth, 36 ft. 6 in.; depth of hold, 18 ft. 2½ in.; and deadweight capacity, 2,550 tons. She is of the well-deck type, with poop, containing saloon, state-rooms, and captain and officers' rooms, long raised quarter-deck, long bridge, and topgallant forecastle for crew. The hull is web framed, and has double bottom under each hold. All modern appliances will be fitted. The machinery is from the Central Engine Works of W. Gray & Co., Limited. The engines are triple-expansion of 750 H.P., and the boilers steel, to work at a pressure of 150 lbs. per square inch. Captain Lowther has superintended the building of the ship on behalf of the owners, and the christening ceremony was gracefully performed by Miss Smurthwaite, daughter of one of the owners.

**Aurora.**—On August 12th Messrs. Ropner & Son launched a steel screw steamer of the following dimensions:—Length over all, 324 ft.; breadth, 40 ft. 6 in.; depth, moulded, 23 ft. 7 in. She will be classed 100 A 1 at Lloyd's, and carry 4,350 tons deadweight on Lloyd's summer freeboard. She has a short full poop, in which is fitted accommodation for captain and officers, a raised quarter-deck, long bridge extending to foremast, short well and topgallant forecastle, with cellular bottom for water ballast. She is built on the web frame principle, and will have all the latest improvements for a first-class cargo steamer. Her engines are by Messrs. Blair & Co., Limited, on their improved triple-expansion principle, 1,200 I.H.P., with two large steel boilers, working at 160 lbs. The steamer has been built to the order of Messrs. Rickinson, Son & Co., of West Hartlepool, and was named *Aurora* by Miss Florence Rickinson, daughter of one of the managing owners. She is fitted with steam windlass by Emerson, Walker & Co., Limited.

**Westhall.**—On August 12th Messrs. Robert Stephenson & Co., Limited, launched from their shipbuilding yard at Hebburn a fine steel screw steamer, which has been built to the order of Messrs. Hunting & Pattison, of London and Newcastle. The vessel is of the three-decked type, with poop aft, under which there are handsomely-fitted cabins for captain, officers, and passengers. There is a long bridge amidships, with accommodation for the engineers, and the crew are berthed in a topgallant forecastle. She has been built to take the highest class at Lloyd's for both hull and machinery. Her dimensions are:—Length, 324 ft.; breadth, 40 ft.; depth, 27 ft. 5 in. She will have a deadweight carrying capacity of considerably over 4,000 tons. The hull is principally constructed of steel, but the decks and the other parts liable to speedy corrosion are of iron. Water ballast is carried in a cellular double bottom extending all fore and aft the ship. She was named the *Westhall* by Mrs. Robert Brydon, of Seaham Harbour.

**Etherley.**—On Tuesday, August 13th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, Willington Quay-on-Tyne, a steel screw steamer, built to the order of Messrs. Hunting & Pattison, of Newcastle and London. She is of the following dimensions:—Length, 265 ft.; breadth, 36½ ft.; and depth, moulded, 18½ ft. She will be fitted with triple expansion engines, having cylinders 20 in., 34 in., and 54 in., by 36 in. stroke, by Messrs. the Wallsend Slipway and Engineering Co., Limited, of Wallsend, and with Kirkaldy's "Compactum" Feed Water-Heater and Kirkaldy's "Compactum" Feed Make-up Apparatus, and all modern improvements for the rapid loading and discharging of cargo. On leaving the ways the vessel was named the *Etherley* by Miss Hunting.

**Torridon.**—On August 13th Messrs. Osbourne, Graham & Co. launched from their yard at Hylton a steel screw steamer, built for Messrs. James Gardiner & Co., of Glasgow. The vessel is of the following dimensions and particulars:—Length, 258 ft.; breadth, 37 ft.; depth, moulded, 19 ft. She is built on the cellular system and with web frames, has full poop, quarter-deck, long bridge, and topgallant forecastle. She will be fitted with tri-compound engines, having cylinders 19 in., 31 in., and 51 in., by 36 in. stroke, by Mr. George Clark, Southwick. She will also have direct steam windlass, four steam winches and steering gear, and will be classed 100 A 1 at Lloyd's. She has been inspected during construction by Captain Gibb and Mr. Cormack on behalf of the owners. As the vessel left the ways she was named the *Torridon* by Miss Graham, of Hylton.

**Royal Prince.**—On August 13th Messrs. J. T. Eltringham & Co., South Shields, put the handsome screw trawler *Royal Prince* into the water. She has been built to the order of Mr. W. H. Storey, North Shields, and, being of large dimensions, also classed to Lloyd's throughout, will in every respect be suitable for either the near or distant fishing grounds. Her dimensions are 93 ft. (i.e., 100 ft. over all) by 18½ by 10½ ft.; and powerful engines of 42 H.P. will be supplied and fitted by Messrs. Baird & Barnsley, North Shields, the cylinders being 16 in. and 32 in. by 22 in. stroke.

**Rydal Holme.**—On August 13th Messrs. John Blumer & Co. launched from their yard the handsome steel screw steamer *Rydal Holme*, built to the order of Messrs. Hine Brothers, Maryport. The principal dimensions of the vessel are:—Length between perpendiculars, 270 ft.; beam, 36 ft. 6 in.; depth, moulded, 20 ft. 2½ in. The vessel is built on the web-frame system, with ordinary double bottom in fore and aft holds. The deck erections consist of short poop aft for captain and officers, long raised quarter-deck, bridge extending to forecastle, to class as part awning deck, with accommodation for engineers and seamen under. The vessel, when completed, is to take the highest class at Lloyd's. The deck machinery includes four powerful winches, worked from large donkey boiler. The winches are by Messrs. Clarke, Chapman, & Co., Gateshead, steam steering gear amidships by Mr. John Lynn, Pallion, patent horizontal steam windlass by Messrs. Clarke, Chapman & Co., and steering gear aft by Messrs. J. Hastie & Co., Greenock. The vessel has all the latest improvements. Her engines are of the triple-expansion type, and built by Messrs. Amos & Smith, Hull, with two steel boilers tested to a pressure of 320 lbs. per square inch. The naming of the vessel was performed by Mrs. Bailey, the wife of the Rev. H. C. Bailey. The vessel, during construction, has been under the superintendence of Captain Brown, Maryport.

**Settembre.**—On August 14th this vessel was successfully launched from the yard of Messrs. Doxford & Sons at Pallion. She has been built to the order of the Compania Bilbaina de Navegacion, Bilbao, is entirely of steel, and built to Lloyd's 100 A 1 class. The principal dimensions are:—Length between perpendiculars, 275 ft.; breadth, extreme, 39 ft. 6 in.; depth from ordinary floor to main deck, 17 ft. 9 in.; depth from ordinary floor to spar deck, 24 ft. 9 in., with cellular bottom fore and aft. The engines are triple-expansion, by Messrs. Doxford, with all the latest improvements, the cylinders being 21½ in., 36 in., and 59 in. by 39 in. stroke, and they are supplied with high pressure steam from large boilers. She is fitted with Bow McLachlan's patent steam steering gear, and Hastie's screw gear aft. She also has two 7 in. by 10 in. and two 6 in. by 10 in. steam winches by Messrs. Welford Bros., of Pallion, with the latest improvements for cargo purposes. The cabins for captain and officers are beautifully got up in hardwood amidships, with the engineers' abaft engine-room in 'tween decks, the crew being comfortably berthed in the fore end of bridge. The christening ceremony was gracefully performed by Miss Mabel Dickinson, of Newcastle.

**Florence.**—On August 14th Messrs. Short Brothers launched from their yard at Pallion, a steel screw steamer, built to the order of Mr. E. T. Gourley, M.P., Sunderland, of the following dimensions:—Length, 292 ft.; breadth, 40 ft.; and 27 ft. 6 in. depth of hold to ordinary floor. The vessel has been built under special survey to the highest class in Lloyd's Registry, and is constructed on the spar deck rule, with long bridge amidships, and topgallant forecastle, with cellular double bottom for water ballast. There are six water-tight bulkheads dividing the vessel into four cargo holds, with a large hatchway and powerful steam winch to each. The steam for winches is supplied by a large multitubular donkey boiler placed on deck under the bridge. The vessel is also fitted with a direct steam windlass, Emerson, Walker & Co.'s patent steam steering gear in midship wheel-house, and screw steering gear in after-house. The after-house also forms entrance to cabin, with smoke-room, and is carried over the stern, forming a hood. The saloon, which is aft, is handsomely fitted up in polished hard wood, the cabins being large and comfortably fitted. The officers' and engineers' accommodation is under the bridge amidships, and the crew are berthed in the topgallant forecastle. The vessel was named *Florence* by Miss Storey, daughter of Mr. Samuel Storey, M.P., Sunderland. The vessel is to be fitted with triple-expansion engines by Messrs. Thomas Richardson & Sons, Hartlepool, with all their latest improvements.

**Dovre.**—On Wednesday, August 14th, there was launched from the yard of Messrs. Edward C. Finch & Co., Chepstow, a steamer 160 ft. by 25 ft. by 12 ft. 9 in., built to the order of Mr. John Pile, of 34, Great St. Helen's, London.

**Boma.**—On August 15th the Naval Construction & Armaments Co., Limited, of Barrow, launched from their yard a steel screw steamer which is to augment the already fine fleet of the British and African Steam Navigation Co., Limited, under the management of Messrs. Elder, Dempster & Co., of Liverpool. The steamer is one of two vessels which the Armaments Co. contracted to construct for the British and African Co. They are exactly on the same lines, and are intended to carry large cargoes on comparatively small draughts. The dimensions of the vessel now launched are: 312 ft. long, by 39 ft. 2 in. beam, with a depth of 27 ft. 6 in. The vessel is built entirely of steel, and is capable of carrying about 5,000 tons of cargo. The engines are to be of the most modern triple-expansion type, capable of producing a fair speed on a minimum consumption of coal. The vessel, which will be classed 100 A1 at Lloyd's, has a cellular bottom, admitting water ballast. Mrs. Alexander Elder, of Southampton, named the steamer *Boma*, *Boma* being an important centre on the Congo. She is fitted with Emerson, Walker & Co.'s patent direct-acting windlass.

#### LAUNCHES—SCOTCH.

**Bridgewater.**—On July 23rd Messrs. A. McMillan & Son, Dumbarton, launched from the dockyard a steel screw steamer of 300 tons burden, named the *Bridgewater*, for the Coastal Steam Packet Co., Nova Scotia. She is expected to attain a speed of ten knots.

**Steam Ferry.**—There was launched, on July 26th, from the shipyard of D. M. Cumming, Blackhill Dock, Glasgow, a steel fore and aft screw ferry, built to the order of the trustees of the Clyde Navigation, for their cross harbour passenger service. Dimensions:—51 ft. by 12 ft. 6 in. by 4 ft. 2 in. The engines, which are being supplied by Messrs. Alexander Chaplin & Co., Cranstonhill, are a pair of high pressure of the inverted diagonal type, having cylinders 6½ in. diameter by 10 in. stroke.

**Port Douglas.**—On July 29th there was launched from the east end shipbuilding yard of Messrs. Russell & Co., Port Glasgow, a steel sailing ship, named the *Port Douglas*, built to the order of Messrs. Crawford & Rowatt, Glasgow. The following are her dimensions:—Length, 260 ft.; breadth, 30 ft.; depth, 22 ft. 9 in.; 1,620 tons register, with a carrying capacity of 2,700 tons. She will be commanded by Captain McDonald, who surveyed her construction. She will fit out in Port Glasgow, and load in Glasgow for the colonies.

**Aconcagua.**—On July 31st Messrs. John Reid & Co. launched a steel screw steamer of the following dimensions:—360 ft. by 41 ft. by 37 ft. Tonnage about 3,200. This vessel has been built for the Compania Sud Americana de Japores, and will be engaged in the passenger and mail service on the West Coast of South America. She is the eighth vessel built by Messrs. Reid for this company, all of which have been constructed under the superintendence of Mr. Thomas Dewsbury, of Leeds. On the vessel leaving the ways she was christened *Aconcagua* by Mrs. Wm. McCracken Nicholson, of Poulton Hey, Spital. The engines, which are of 3,500 I.H.P., are being constructed by Messrs. John and James Thomson, of Glasgow. She is fitted with a patent windlass, by Emerson, Walker & Co., Limited.

**Twilight.**—On July 31st there was launched from the shipbuilding yard of the Grangemouth Dockyard Co. a handsomely-modelled steel screw steamer, built to the order of Christopher Furness, West Hartlepool. The dimensions are as follows:—260 ft. by 35 ft. by 19 ft. She has raised quarter-deck, bridge, and topgallant fore-castle, and is fitted up with all the latest improvements for working both ship and cargo, including Clark, Chapman's steam winches, McOnie's patent direct steam windlass, and Alley & McLellan's sentinel steam steering gear. The engines are being supplied by Messrs. Hutson & Corbett, Kelvinhaugh Engine Works, Glasgow; cylinders, 18 in., 30 in., and 48 in. by 36 in.; 160 lbs. working pressure. As the vessel left the ways she was christened the *Twilight* by Miss Miller, daughter of one of the builders. The vessel is intended for the general carrying trade, and will carry a deadweight of about 2,300 tons.

**Manhattan.**—On July 31st there was launched from the yard of Messrs. David J. Dunlop & Co., engineers and shipbuilders, Port-Glasgow, a large steamer (one of two sister vessels) built

for the Anglo-American Oil Co., Limited, of London, and intended to carry petroleum between America and the United Kingdom. This vessel, which has been most substantially built of steel, in excess of Lloyd's requirements, is classed 100 A in Lloyd's registry as a spar-deck steamer, with poop bridge and fore-castle, and is sub-divided into 18 oil-tight and six water-ballast trimming tanks. The oil tanks were tested to a 20 ft. head of water, which they successfully withstood—the whole of the testing having been carried out under the direct superintendence of Lloyd's and the owners' consulting naval architect and engineer, Mr. George Eldridge, of London. The principal dimensions are as follows:—Length of load line, 330 ft.; breadth moulded, 42 ft.; depth, moulded to spar deck, 29 ft. 6 in. The vessel is constructed to carry 4,000 tons of oil in bulk, and sufficient coal for the return voyage. The appliances for working the vessel and rapidly loading and discharging her oil cargo include steam winches, steam windlass, steam capstan aft, and steam pumps capable of running into or out of the tanks 4,000 tons of oil in 10 hours, and Alley & McLellan's steam steering gear, and electric lighting throughout. The machinery, which is supplied by the builders, is designed to propel the steamer at a minimum speed of 10 knots in regular loaded service, and is of the three-cylinder type, with large surplus boiler power for a working pressure of 160 lbs. of steam.

**Ribago.**—On July 22nd Messrs. David J. Dunlop & Co., engineers and shipbuilders, launched from their shipbuilding yard a steel paddle steamer of 450 tons gross, and of the following dimensions:—Length, 192 ft.; breadth, 29 ft.; and depth, 9 ft. The new vessel has been built to the order of the Royal Niger Co., Chartered and Limited, of London, for up-river service on the West Coast of Africa, and on leaving the ways she was named *Ribago*. She is a sister ship to the *Kano*, built by Messrs. Dunlop & Co. in 1882 for the same owners. The *Ribago*, which is furnished with all modern appliances, including steam steering gear, steam cranes and windlasses, will be fitted with two sets of compound disconnecting engines of about 600 H.P. She is expected to leave for her destination in the course of from 10 to 14 days.

**Craiglee.**—On August 1st the Campbelltown Shipbuilding Co. launched from their yard at Trench Point, Campbelltown, a handsomely-modelled steel screw steamer, of 3,300 tons deadweight, to the order of Messrs. Biggart & Fulton, Glasgow. This steamer has been built under Lloyd's special survey to class 100 A 1, has raised quarter-deck, long bridge house and topgallant fore-castle, is fitted with Messrs. Alley & McLellan's steam steering gear amidships, Hastie's screw gear aft, Harfield's patent steam engine lever windlass, lighthouses, &c.; has cellular double bottom throughout, and all the latest improvements. Dimensions:—Length, between perpendiculars, 285 ft.; breadth, 39 ft. by 21 ft. 3 in. moulded depth. Her engines, on the triple-expansion principle, having cylinders 21 in., 33 in., and 54 in., by 39 in. stroke, are by Messrs. Muir & Houston, Glasgow. The vessel was named *Craiglee* by Miss Biggart, of Woodbine, Bridge of Weir.

**Ulala.**—On August 1st there was launched from the yard of Mr. Robert M'Allister, Dumbarton, a handsomely-modelled screw steam yacht of 53 ft. in length. She is built diagonally of teak to the highest class, and will be fitted with triple-expansion engines, forced draught, and all latest improvements by Messrs. M. Paul & Sons, Dumbarton, and is expected to obtain a high rate of speed. On leaving the ways she was gracefully christened the *Ulala* by Miss M'Allister. The yacht has been built to the order of Messrs. J. F. Borthwick & Co., to fill a foreign order.

**Capricornus and Aquarius.**—On August 8th there were launched from the shipbuilding yard of Messrs. Mackie & Thomson, Govan, two steam fishing and trawling vessels for the Grimsby and North Sea Steam Trawling Co., Limited, Grimsby. The vessels are each 113 ft. by 20 ft. 6 in. by 11 ft. 6 in., classed 100 A 1 at Lloyd's, and built considerably in excess of their rules, great strength being a special requirement for the rough work of fishing in the North Sea. They will be fitted by Messrs. Muir & Houston, Glasgow, with triple-expansion engines, having cylinders 11 in., 16½ in., and 27 in. diameter, with a stroke of 22 in., and large boilers to carry a working pressure of 160 lbs. A new feature in these vessels is a well, specially constructed for bringing the fish alive to market. In one of the vessels this well is fitted with holes perforated through the ship's sides and bottom to allow of a natural circulation of water for the preservation of the fish. In the other ship a distinct departure has been made by the

adoption of Messrs. Charlton & Alward's patent well, which provides for the inlet of water at the fore end by a large valve on the vessel's bottom, its distribution by means of large roses on the bulkheads of the well, and drawing the circulating water required for the engine condenser from the after-end. This arrangement provides for a continual supply of fresh water for the fish, and is expected to prove of great commercial value, as thereby the fish will be landed in a more healthy state. The first of the vessels was named *Capricornus* by Miss Mary Houston, and the other *Aquarius*, by Miss Balfour.

**Neotsfield.**—On August 10th there was launched from the yard of Messrs. A. McMillan & Son, Dumbarton, a handsome iron sailing ship of about 2,000 tons. This vessel, which was named the *Neotsfield*, has been built to the order of Messrs. Dangar, Grant & Co., of London, is especially designed for their Australian trade, and fitted with all the latest improvements. Her dimensions are 257 ft. by 39 ft. 9 in. by 24 ft. 1½ in. After the launch the vessel was taken alongside the builders' yard to receive her masts, &c. The naming ceremony was performed by Miss Dangar.

**Mabel.**—On August 10th Messrs. S. & H. Morton & Co. launched from their building yard, at Leith, a steel screw steamer, 160 ft. by 23 ft. by 12 ft. 6 in., built to the order of Messrs. J. Burnett & Sons, of Mincing Lane, London, and from the designs of Mr. R. J. Quelch, London. On leaving the ways the vessel was named the *Mabel* by Miss Mabel Burnett. The ship is to be fitted by the builders with triple-expansion engines, having cylinders 14 in., 22 in., and 36 in. diameter, by 24 in. stroke, working at 160 lbs. pressure, and has been specially designed and built to trade direct in a regular service between London and Paris.

**Mildred.**—On August 13th a new three-masted schooner was launched from the shipbuilding yard of Captain Rawle, Padstow. She is a well-modelled, fine looking vessel, of good carrying capacity, from 350 to 400 tons burthen, named *Mildred*, owned by Messrs. W. C. Phillips & Co., and will be registered at the port of Padstow.

**Aska.**—On August 13th there was launched by the Ailsa Shipbuilding Co., Troon, for the British India Steam Navigation Co., Limited, a steel screw steamer, 190 ft. by 29 ft. by 20 ft., for their Indian coasting trade. She is fitted with steam steering gear, steam windlass, and all the newest appliances, including electric light throughout the ship. The engines are triple-expansion, 16 in., 26 in., 42 in., by 30 in. stroke, and are being constructed by Messrs. Dunsmuir & Jackson, Govan. The vessel was named *Aska* by Mrs. F. J. Turner, of Mansfield.

**Loanda.**—On August 14th Messrs. Scott & Co., shipbuilders, Greenock, launched from their yard at Carsdyke a large and handsomely-modelled steel screw steamer, of 3,400 tons register, for the Mala Real Portuguese, of Lisbon. Her dimensions are:—Length, 350 ft.; breadth, 42 ft.; and depth, moulded, 28 ft. 6 in. The engines, of 4,000 H.P. (indicated), are on the triple-expansion principle, and have been constructed by Messrs. Scott & Co. She has been built under special survey, is classed 100 A 1 at Lloyd's, and is intended to trade between Lisbon and the Portuguese colonies in Africa. Like her sister ship, the *Rei de Portugal*, she is equipped with all the latest improvements, and will be fitted up with refrigerating machinery and chambers, electric light, &c. She has accommodation for 75 first-class, 21 second-class, and 120 third-class passengers, and 240 soldiers. The new vessel on leaving the ways was named *Loanda*, after the Portuguese settlement of that name on the West Coast of Africa. She is the third of a fleet of five steamers ordered this year from Messrs. Scott & Co. by the Mala Real Portuguese of Lisbon.

**Bellona.**—On August 15th Messrs. D. & W. Henderson & Co., of Meadowside, Patrick, launched a steel screw steamer, built to the order of Messrs. Bell Brothers & McLelland. The steamer, which is fitted with all recent appliances, is designed to carry about 4,100 tons, and was named, as she left the ways, *Bellona*, by Miss Colquhoun, of Shemore, Luss. Messrs. Henderson have two other steamers under construction for the same owners.

**St. Fergus.**—On August 15th Messrs. Fleming & Ferguson, shipbuilders and engineers, Paisley, launched a steel screw steamer of 600 tons, built to the order of the Wick and Pultneytown Shipping Co. She is to be fitted by the builders with a set of their patent balanced quadruple engines to indicate 600 H.P. As she left the ways she was named the *St.*

*Fergus* by Miss Anna Reiach, Edinburgh, daughter of the Inspector-General of Fisheries of Scotland.

**Steam Yacht.**—On August 15th Mr. Robert Gordon, boat-builder, launched at the Albert Harbour, Greenock, a finely modelled steam yacht. She is built of yellow pine, and is 45 ft. in length. She is for Mr. W. Brand, Saw Mills.

**Friesland.**—On August 15th the Belgian Royal and U.S. Mail steamer *Friesland*, built for the Société Anonyme de Navigation Belge-Américaine of Antwerp, commonly known as the Red Star Line, was launched from Messrs. James and George Thomson's shipbuilding yard at Clydebank, in the presence of a large company of spectators, comprising many of those officially concerned in the new steamship. When completed the *Friesland* will undoubtedly form the finest, as she is the largest, addition made to this line of steamers. The Red Star line is not so old a concern as some of the other transatlantic steamship companies, but it has the vigour characteristic of robust age, having within a few years added five or six vessels to the fleet. It was instituted in 1873 in response to a wish expressed by travelling Americans for a line of steamers running direct to a continental port within easy distance of Paris, the Rhine, and other tourists' haunts. In fixing upon Antwerp as the port of destination the promoters have, to judge from the popularity of the route, chosen a thoroughly suitable port. This is, it may be noted, the first vessel built by Messrs. Thomson for this company—indeed, it is the first constructed on the Clyde. The *Fr. island* has been designed pretty much on the same lines as the *City of Paris* and *City of New York*, being fine-ended and having a clipper bow. Her length over all is 450 ft., the breadth 51 ft. 3 in., and the depth, moulded, 38 ft., while her gross tonnage will be 6,700 tons. In her design and construction care has been taken to make her safe in the event of casualty. She is built of Siemens-Martin steel, and to accord with the highest class at Lloyd's and Bureau Veritas. With a double bottom on the cellular principle, she is free from harm if she grounds, and can carry water ballast to the extent of 1,000 tons. Internally she is divided transversely by nine bulkheads, and the only doors are placed 8 ft. above the load water-line, so that there can be no possibility of water finding its way from one compartment to another. Assuming any two compartments to be filled with water, the vessel would still float. The passenger accommodation is arranged on the same principle as in the case of the new Inman and International liners, the first-class rooms being in the centre of the vessel, while the second-class passengers are located abaft the machinery space, and the emigrants fore and aft, where they will enjoy the largest deck area. In the arrangement of boilers and machinery the convenience and comfort of the passengers has been studied, because there are no openings on the promenade decks. The *cuisine*, too, is relegated to the lower deck and communication established with the pantry by means of hoists. There are four decks—the lower, main, upper, and promenade—the latter of which, extending two-thirds the length of the vessel, is for the use of first-class passengers, while the poop is reserved for second-class voyagers. In all 226 first-class passengers are provided for. The dining-saloon is on the upper deck, forward of the machinery, and is large and airy, being lighted by a dome-shaped well, framed with chastely-decorated stained glass on the top. The entrance to the saloon is from a hall beside the stairway, and adjoining the landing at the top is the drawing-room. The first-class smoking-room is on the promenade deck in a house by itself, placed abaft the machinery. Six well-appointed state-rooms are arranged on the promenade deck, and have a special stairway to the saloon, so that communication from the one to the other may be made without going on the deck. On the upper deck, adjoining the saloon, are seventeen state-rooms finished in the Pullman style, and the remainder of the apartments for the first-class passengers are on the main deck under the saloon. The number of second-class voyagers arranged for is 102. The dining and smoking saloons, both finished in hardwood, are on the main deck, abaft the machinery, while the state-rooms are on the main and lower decks. The third-class passengers, of whom 600 may be carried, have every convenience. A special feature may be indicated. The fitting of bulkheads complete to the upper deck makes it necessary to have each water-tight compartment self-contained, and separate entrances are given to each. Houses have been built on the main deck giving this ingress and at the same time affording lavatory and sanitary arrangements for the passengers occupying the compartment. The

crew is accommodated under the fore-castle, and the officers under the poop. Throughout the ship are a large number of Broadfoot's ventilators, the special feature of which is that they may be left open in all weathers, as they close automatically when struck by a sea. The propelling machinery is of the triple-expansion type, and has been designed to take up the least possible room. The diameter of the cylinders are 35½ in., 56 in., and 89 in. respectively, with a piston stroke of 4 ft. 6 in. The high and intermediate cylinders have piston valves, and the low-pressure cylinder an ordinary flat slide valve. Steam is supplied by three double boilers and a single-ended one, having 21 furnaces, with Purves's ribbed flues and Henderson's patent fire bars. In addition there are two donkey boilers for driving the auxiliary machinery. The boilers are worked under forced draught on the closed stokehold system, and the working pressure is to be 160 lbs. to the square inch. Of her auxiliary engines possibly the most noteworthy is the steering gear, which is on Mc'Ginnis's patent, and works direct on to the rudder head. It has a specially-devised spring buffer arrangement in the form of oil cylinders, which not only deadens the shocks of the sea, but registers them. Kilburn's ammonia refrigerator with 5,000 cubic feet capacity is provided. The installation of electric light is by Messrs. Parson & Co., the number of lamps being 500. Two special turbine dynamos are fitted on board, and each is capable of maintaining all the lights in the ship. The vessels has the usual winches, windlass, warping gear, &c. She carries lifeboats to accommodate all on board, there being ten of the ordinary type and two of Chambers's semi-collapsible boats. These are all carried above the promenade deck. The *Friesland* will have one funnel, with a red star on the side of it, and four masts—the two foremasts being square-rigged and the other two fore and aft. The vessel, which has been superintended, will also be commanded by Captain Randle, the commodore of the Red Star fleet. The launch of this large vessel was attended with every success, the ceremony of naming being performed by Mrs. Marsily, wife of Mr. W. E. Marsily, director of the Société Anonyme de Navigation Belge-Américaine, who, with many others interested in the new vessel, was also present.

**Rex.**—On August 16th, there was launched from Messrs. Ramage & Ferguson's shipbuilding yard at Leith a steel screw steamer, named the *Rex*, built to the order of Messrs. R. Conaway & Co., Liverpool. Dimensions:—265 ft. by 36½ ft. by 14 ft. 4 in., moulded, and having poop, raised quarter-deck, long bridge, and top gallant fore-castle. The engines, which are also made by Messrs. Ramage & Ferguson, are triple-expansion, having cylinders 21 in., 34 in., and 56 in. diameter, by 36 in. stroke, and are supplied with steam from two steel boilers working up to 160 lbs. pressure. The *Rex*, which has been built under the superintendence of Messrs. Ashlin & Ashbridge, of Liverpool and London, on being launched, was named by Miss Nellie Tullis, Inchcape, Glasgow. This is a duplicate of the s.s. *Realm*, launched from the same yard for Messrs. R. Conaway & Co. a few weeks ago.

**Hsin-Yu.**—On August 23rd, Messrs. Napier, Shanks & Bell, Yoker, launched the *Hsin-Yu*, a two-deck steel screw steamer of about 1,350 tons gross, built to the order of the China Merchant Steam Navigation Co., of Shanghai, for river and coast service in China. This vessel has been specially designed with a view to large carrying capacity on light draught, while superior accommodation is provided in deck-houses for a number of passengers. The dimensions are 250 ft. by 36 ft. by 20 ft. 8 in. The deck fittings include steam windlass, steam steering gear, screw gear aft, and all appliances for the efficient working of the vessel. The engines, which will be put on board by Messrs. Dunsunuir & Jackson, are of the triple-expansion type, with all the most improved appliances for economy in working.

### TRIAL TRIPS.

**Prudentia.**—On July 23rd this ship, built by Messrs. Palmer's Shipbuilding Co., Jarrow, to the order of Alfred Stuart, Esq., of London, was taken for load trial at sea. She is 312 ft. long, 40 ft. beam, and 28 ft. depth, and is constructed for the carriage of petroleum in bulk. She is fitted with seven double oil tanks, capable of holding 3,400 tons of cargo, and is specially designed and ventilated for a mixed cargo of crude and refined oil. The vessel was designed by Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, and has been built under their super-

intendence. She is fitted with engines having cylinders 25½ in., 37 in., and 62 in. diameter, with 42 in. stroke, and supplied with steam from boilers having about 4,500 ft. of heating surface. Electric light and steam heating and cooking apparatus are fitted together with powerful pumps for quick handling of oil cargo. She is also arranged with a view to the carriage of general cargo if desired. The deadweight on board at the trial was about 3,000 tons, and a very satisfactory progressive trial was made, steam being easily maintained and the full speed runs giving a mean of 10·7 knots. Steam steering gear, evaporator, and feed heater are fitted together with other modern improvements for economy and quick handling.

**Attila.**—On July 27th the s.s. *Attila*, built by Messrs. R. Craggs & Sons, of Middlesbro', for Messrs. J. M. Lennard & Sons, also of Middlesbro', was taken out on her official trial trip, and although the weather was anything but favourable, the result proved to be very satisfactory. The engines are supplied by Messrs. Westgarth, English & Co., of Middlesbro', having cylinders 21 in., 34 in., and 57 in. by 39 in., indicated 1,160 H.P., and worked throughout the day in a very satisfactory way. The dimensions of the vessel are: 280 ft. by 37 ft. 6 in. by 25 ft. 6 in. She has been built to carry oil in bulk, and is fitted with all the latest improvements. The oil pumps are Messrs. Tangye's "Duplex" pumps, and the electric light installation is by Messrs. Holmes & Co., Newcastle.

**Aberfeldy.**—On July 29th the screw steamer *Aberfeldy*, built by Messrs. John Readhead & Sons, South Shields, for Messrs. Maclean, Doughty & Co., West Hartlepool, left the Tyne on her trial trip. The vessel is 290 ft. long; 39 ft. broad, and 21 ft. 8 in. deep, moulded, and she has a deadweight capacity of 3,450 tons. She is of the improved well-decked type, and is fitted with all the requirements of the Grain Cargoes Act. The engines, which have also been constructed by Messrs. Readhead & Sons, are on the triple-expansion principle, having cylinders of 22 in., 36 in. and 60 in., with a 39-in. stroke, and the vessel is classed 100 A 1 at Lloyd's. The steamer made an average of 11½ knots over the measured mile, and everything passed off most satisfactorily.

**Rion.**—On July 30th the steamship *Rion* proceeded from the Tyne on her trial trip. This vessel has been built to the order of Messrs. Forster & Co., Newcastle, by Messrs. Palmer & Co., engineers and iron shipbuilders, Jarrow, and has been specially constructed for the oil trade. Her leading dimensions are:—Length over all, 280 ft.; breadth, moulded, 37 ft. 6 in.; depth, moulded, to main deck, 20 ft. 4 in. The engines, which are of the triple-expansion type, have been supplied by the firm, and during the trial gave every satisfaction, the speed, as registered on the measured mile, being 11½ knots per hour. The vessel has been constructed to carry 2,700 tons of petroleum in bulk, and 300 tons of coal on 20 ft. mean draught.

**Redpole.**—On Tuesday, July 30th, H.M.S. *Redpole* underwent her 12 hours natural draught trial in the Channel, she having been taken out of Devonport Dockyard, with Mr. B. Dixon in charge of the machinery. This vessel is one of three built at Pembroke Yard, and engined by Earles' Shipbuilding & Engineering Co., Limited, Hull. The results were in every way satisfactory, as the power obtained was a mean of 936 I.H.P., or 30 per cent. in excess of contract, and a speed of 13·2 knots. Her four hours forced draught trial was also brought to a successful issue on the 1st August, when she averaged 1,243 I.H.P., and 14½ knots, after which she was taken back to the dockyard for opening up.

**Ironopolis.**—On July 30th, the s.s. *Ironopolis*, proceeded from the Tees on her trial trip. This vessel has been built for Messrs. J. M. Lennard & Sons, of Middlesbro', by Messrs. Raylton, Dixon & Co., of the Cleveland Dockyard, being the seventh vessel they have built for this firm. Her leading dimensions are:—Length over all, 305 ft. 3 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in., with a deadweight carrying capacity of over 3,700 tons. She is fitted with raised quarter-deck, having bridge and fore-castle connected, thus classing her as a partial awning deck. Her engines have been supplied by Messrs. Blair & Co., Stockton, of 180 N.H.P., with cylinders 22½ in., 36½ in., and 60 in., by 39 in. stroke. The *Ironopolis* is the largest steamer owned in the Port of Middlesbro'.

**Dalmally.**—On August 7th, the new steamer *Dalmally*, recently launched by Messrs. Edward Withy & Co., West Hartlepool, and built for George Horsley, Esq., of West Hartlepool, left Hartlepool on her trial trip. The dimensions of the vessel are 290 ft. by 40 ft. 1 in. by 19 ft. 3 in. The engines, which

are of the triple-expansion type, have been constructed and fitted on board by Messrs. T. Richardson & Sons, Hartlepool; cylinders, 22 in., 35 in., and 59 in., by 39 in. stroke, supplied with steam by two large boilers at 160 lbs. pressure. After running the measured mile, the ship proceeded to the Tyne to load. The engines worked very smoothly throughout the trip, and gave the greatest satisfaction to all concerned.

**Lord Aberdeen.**—On August 7th the new screw-steamer *Lord Aberdeen*, lately launched by Messrs. S. McKnight & Co., Ayr, left Glasgow to adjust compasses in the *Gareloch* and to have a speed trial on the measured mile at Skelmorlie. Her dimensions are—245 ft. by 34 ft. by 17 ft. hold; raised quarter-deck, short poop for cabin accommodation, bridge deck amidships over machinery space, and top-gallant forecastle for crew. The engines, which have been supplied by Messrs. Huston & Corbett, Glasgow, are triple-expansion; cylinders 21 in., 34 in., and 56 in. diameter, by 39 in. stroke. She had 1,900 tons deadweight on board, and attained a speed of fully 10½ knots. After running the mile the vessel proceeded down the Firth, the engines working most satisfactorily. The owners, Messrs. James & Alexander A. Wyllie, Troon, and a large party of friends, together with Mr. McKnight of the building firm, Mr. Hutson of the engineering firm, and Mr. David Pollock consulting engineer, Glasgow, were on board, and as the day was fine the vessel cruised towards Lamlash, thence to Troon, where Messrs. Wyllie, and their friends were landed. Immediately afterwards the *Lord Aberdeen* proceeded on her voyage to Savona.

**Moray.**—On August 8th the new steamer *Moray*, recently launched by the Grangemouth Dockyard Co. from their new yard at Alloa, and built to the order of Mr. William Adam, Burghhead, for his coasting trade, went down the Firth of Forth on her official trial trip. The vessel is of the following dimensions:—130 ft. by 24½ ft. by 11½ ft., and built to the highest class at Lloyd's, and fitted with all the latest improvements for working ship and cargo with economy and despatch. The engines, which are of the new three crank triple-expansion type, have been constructed and fitted on board by Messrs. Alley & McLellan, Polmadie, Glasgow; cylinders 13 in., 21 in., and 34 in. by 27 in. stroke, supplied with steam by an extra large boiler, at 160 lbs. pressure. On trial a speed of 12 knots was attained, which was much in excess of that contracted for. The machinery worked smoothly throughout, the trial lasting the whole day, and gave the greatest satisfaction to all concerned.

**Ostrich.**—On August 9th the new Hull steam trawler *Ostrich*, which has been built to the order of Mr. W. H. Putt, was taken on her trial trip. The *Ostrich* has been built by Messrs. Cook, Welton & Gemmell, and engaged by Messrs. C. D. Holmes & Co. Her dimensions are:—Length, 100 ft.; breadth, 20 ft. 9 in.; with 11 ft. 6 in. depth of hold. She is about 130 tons gross, 49·90 tons net register. Her engines are of the compound type, and her steel boiler works with a pressure of 90 lbs. to the square inch. When the runs were made to test the vessel's speed 11 knots per hour were recorded. The *Ostrich* has taken the place of the *Heron*, owned by Mr. Putt, which has been sold to form the pioneer vessel of the Liverpool Steam Trawling Co.

**Alphonse Parran.**—On August 9th, this vessel, recently built by William Doxford & Sons, sailed from the Tyne with a full cargo of coal and patent fuel for Algiers. She has been built to the order of the Anglo-Algerian Steamship Co., which is managed by Messrs. Strick & Co. Previous to leaving for her destination, she was run on the measured mile, and most satisfactory results were obtained.

**Bayonne.**—On Aug. 10th the official trials of the s.s. *Bayonne*, built by Messrs. A. & J. Inglis, for the Anglo-American Oil Co., were completed with most satisfactory results. A series of runs were made at various draughts of water for the purpose of ascertaining, if possible, the most advantageous conditions of loading when the vessel is employed on the trade for which she has been built, and from the experiments of Friday and Saturday much useful information will be at the disposal of the builders for the guidance of the owners. Trials of this kind would be tedious and expensive in the case of vessels carrying ordinary general cargo, but in steamers of the *Bayonne* type, fitted with pumps capable of dealing with five tons of water per minute, they can be altered with great ease and rapidity. At the immersion (23 ft.) the mean full speed was found to be 15½ knots. This was in excess of the builders' guarantee, and highly satisfactory to the owners, who were repre-

sented by Mr. J. D. Jamieson, Esq., a director of the Anglo-American Oil Co., and Mr. Geo. Eldridge, consulting naval architect to the company. The important question of the stability of the vessel in the critical conditions inseparable from the peculiar trade for which she is intended was carefully considered while the vessel was being designed, and the elaborate calculations then made were practically tested by filling the oil tanks one after another. It was found that, taking suitable precautions, four tanks could be filled simultaneously without producing any instability, and thus a troublesome cause of delay and anxiety has been avoided. The *Bayonne* is commanded by Captain Payne, an experienced shipmaster, and from the care with which the vessel has been designed and constructed, her ample engine power, and the liberal scale on which she has been equipped and manned, the owners confidently expect she will carry her somewhat difficult cargo with great safety and at an unusual rate of speed.

**Roumania.**—On August 12th this steamer underwent her official trial in Liverpool Bay. The *Roumania* has been designed for the Danube and Black Sea Navigation Steamship Co. by Messrs. John Jones & Sons, primarily for towing lighters laden in bulk with petroleum from Sulina to the Austrian frontier on the Danube; and the trial proved her a most suitable vessel for the purpose. The dimensions of the vessel are 145 ft. by 20 ft. by 8 ft., and the engines are two pairs of disconnecting compound tandem diagonal of 500 I.H.P. These on the trial propelled the vessel at a mean speed of 12 knots, on a draught of 4 ft. 1½ in., and a consumption equal to 7½ tons in 24 hours. The *Roumania* has feathering wheels, and steel has been largely used in her construction to insure lightness and strength. This is the second steamer built this year by Messrs. Jones for the same owners.

**Egyptian.**—On August 14th the steamer *Egyptian*, belonging to Messrs. F. Leyland & Co., went on her official trial trip, after having had new cylinders and boilers fitted for a working pressure of 150 lbs. per square inch. The engines, working at 65 revolutions, indicated 1,240 H.P., and the vessel attained a mean speed of 11·75 knots. The work has been carried out by Messrs. David Rollo & Sons, engineers, of Liverpool, under the direction of the company's superintendent engineer, Mr. Neville Evans. This firm has another steamer in hand for the same company for similar alterations.

**Gazelle.**—On August 14th the new twin screw steamship *Gazelle* was taken down the Mersey on her trial trip, preparatory to being handed over to her owners. The *Gazelle* is one of the three vessels constructed by Messrs. Laird Brothers, of Birkenhead, for the Great Western Railway Co. for their service between Weymouth and the Channel Islands. She is 235 ft. long between perpendiculars, and 228·7 ft. long on the load water-line. The greatest beam is 27·6 ft.; depth, moulded, 14 ft., and the load draught is 11 ft. aft and 9 ft. forward. At this draught she displaces 790 tons. The vessel is fitted with two pairs of direct inverted tri-compound engines, having cylinders 16½ in., 26 in., and 41 in. in diameter, by 30 in. stroke. When running full open the engines make 120 revolutions per minute, and develop a collective power equal to 1,680 horses, and drive the ship at a speed of 17 knots. Steam is supplied by two steel single-ended boilers, each 14 ft. 6 in. long by 10 ft. diameter. Each boiler has three of Fox's corrugated furnaces. Steam of 150 lbs. per square inch is carried. Forced draught on the closed stoke-hole system is used, the air pressure in the stoke-hole being about ½ in. The total heating surface is 3,800 square feet, and the total grate area is 118 square feet. The weather on the occasion of the trial was anything but favourable. A No. 6-7 gale from the S.S.W. was blowing, accompanied by rain and a nasty choppy sea. The *Gazelle*, having arrived on the measured mile, four runs were made, which gave a mean speed of 17·04 knots. During the speed trials the mean revolutions of the engines were 120, mean steam pressure 149 lbs. per square inch, air pressure in stoke-hole ½ in., and the mean I.H.P. 1,650 (both engines). Considering that the contract speed was only 16 knots, it will be conceded that Messrs. Laird have done remarkably well, and, needless to say, the G.W.R. are extremely well satisfied.

**Crimea.**—On August 15th the iron screw steamer *Crimea*, built by the Blyth Shipbuilding Co. at Blyth, had a highly satisfactory trial trip. The *Crimea* has been constructed to the order of Messrs. Stephens, Mawson & Goss, of Newport (Mon.), and measures 260 ft., by 36½ ft. beam, with a depth of 19½ ft. She has a long bridge, cellular double bottom for water ballast, and an outfit complete with every requisite for the quick and

proper working of ship and cargo. The engines are of the triple-expansion kind, of 160 N.H.P.; they have been supplied by Messrs. Black, Hawthorn & Co., of Gateshead, and gave results highly satisfactory to the numerous company on board. The *Crimea* is now loading at Low Walker, and is under the command of Captain Work.

**Hibernia.**—On Friday, August 16th, the new steel screw steamer *Hibernia*, recently launched from Messrs. Raylton, Dixon & Co.'s No. 1 Shipyard, Middlesborough, to the order of the International Line Steamship Co., Limited, Whitby, had her trial trip at sea. This vessel is built on the partial awning deck type, and is fitted up with all the most modern improvements to suit the trade for which she is intended. The principal dimensions and features of the vessel are as follows:—Length over all, 305 ft.; breadth, 38 ft.; depth moulded, 23 ft. 10 in., having cellular bottom fore and aft for water ballast, her deadweight carrying capacity being 3,650 tons. The two forward hatches are trunked between decks, and the vessel throughout is so supplied with feeders as to make her in every way fitted for the carriage of grain in bulk, according to the Board of Trade regulations. The winches, which have been supplied by Messrs. Clark, Chapman & Co., of Gateshead, are constructed with exceptionally large barrels and whipping drums, enabling the cargo to be very speedily discharged. The engines and boilers, which are from the works of Messrs. Thomas Richardson & Sons, Hartlepool, are on the triple-expansion principle, having cylinders 22 in., 35 in. and 59 in. diameter, with a stroke of 39 in., and worked throughout the trial without the slightest hitch, and have been supplied with Mr. Morrison's patent evaporator for the supply of heated condenser feed water to the boilers. During the trial with 160 lbs. boiler pressure and 82 revolutions, the steamer attained a speed of 12½ knots, which was considered highly satisfactory by those interested, and she promises to be a very fast and profitable steamer. The hull and machinery have been personally superintended on behalf of the owners by Captain R. K. Smith, of Robin Hood's Bay. After the trial she proceeded to Cardiff to load for Cape Vendes, and from thence she proceeds to the cotton ports. Among those present were Messrs. Bell, Bentley, Swainson (directors), and several other gentlemen.

**Aquila.**—On August 16th the loaded and progressive trials of the *Aquila* were brought to a satisfactory conclusion. This fine steamer has been built and engined by Wigham, Richardson & Co., for Messrs. Lavarello, of Genoa, and is the ninth steamer which those gentlemen have had from the Neptune Works. The speed attained was over 17 knots, which will enable her to beat the record between Genoa and the River Plate. The *Aquila* is a twin screw steamer of 5,500 H.P., and is fitted up with all that minute attention to the comfort of emigrants—1,200 to 1,300 in number—which has so largely conduced to the success of Messrs. Lavarello's line. Each emigrant has a comfortable iron bedstead with a mattress and pillow; and extensive refrigerating machinery will supply fresh meat and iced water in abundance during the whole voyage. All the appurtenances are equally well thought out, and the vessel is lit up throughout with incandescent electric lights, furnished by the firm of Alberto Preve, of Genoa.

**Dunmore Head.**—Last month the screw steamer *Dunmore Head*, built by Messrs. Workman, Clark & Co., Belfast, and engined by Messrs. J. & G. Thomson, Glasgow, for the Ulster Steamship Co., went on her trial trip on the Firth of Clyde, and attained very satisfactory results, the speed being about 10½ knots. The *Dunmore Head* is a vessel 301·8 ft. long, 40 ft. beam, and 23 ft. 0½ in. deep to top of keelson. The machinery is of the triple-expansion type, the cylinders being 22 in., 36 in. and 60 in. in diameter respectively, with a piston stroke of 3 ft. 6 in. There are two boilers, each 14 ft. in diameter and 11 ft. long, and having in all six furnaces 3 ft. 4 in. in diameter, fitted with Purve's patent ribbed flues, and the working pressure is 170 lbs. The gross heating surface is 3,362 square feet, grate surface 115 square feet, and condensing surface 2,138 square feet. The propeller has steel blades, and is 15 ft. 9 in. in diameter, with a pitch of 18 ft., and a service of 66 ft. The feed-heater, evaporator, and air-separator are by Mr. A. McLean, chairman of the Ulster Steamship Co.

**Beagle.**—The *Beagle*, which is being got ready for service on the south-east coast of America, has completed her steam trials at Portsmouth. The four hours' trial with closed stokeholds gave a collective mean power of 2,106 horses (contract 2,000), and a speed measured by patent log of 13½ knots. At

the twelve hours' trial under natural draught 1,551 horses were obtained, with a speed of 13 knots. The engines are by Messrs. Rennie & Co., Blackfriars.

**Daylight.**—On Saturday morning, August 17th, the s.s. *Daylight*, a fine steel screw steamer, which has been built by Messrs. Raylton, Dixon & Co., of West Hartlepool, proceeded from the Tees on her trial trip. Her leading dimensions are:—Length over all, 305 ft. 3 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in., with a deadweight capacity of over 3,600 tons. She is built with raised quarter-deck, topgallant foremast and long bridge amidships, extending beyond foremast. Her engines by Messrs. T. Richardson & Sons, Hartlepool, on their triple-expansion principle, with cylinders, 22 in., 35 in., and 59 in., by 39 in. stroke, have been fitted with Morrison's patent evaporator for feed-water, and his patent fire-bars, all of which worked with complete success. A large party of her owners and others made the run with her to Tyne Dock, and expressed great satisfaction with the vessel, which has been built under the superintendence of Mr. Craig, the overlooker for her owners.

**Sudero.**—On Wednesday, August 21st, Messrs. Earle's Ship-building and Engineering Co., Limited, of Hull, took out to sea for her trial trip the new steam fishing vessel *Sudero*, which they have just completed to the order of Mr. Henry Smethurst, jun., of Grimsby, for the Grimsby White Star Fishing Co. The dimensions of the vessel are—105 ft. by 20 ft. 6 in. by 11 ft. 6 in., the engines being triple-compounds. She is designed for line as well as trawl fishing, being provided with a perforated well and other special arrangements for that purpose. Before starting for Withernsea, the compasses were adjusted by the maker, Mr. O. T. Olsen, and a course was then made for the measured mile, where most favourable results were shown, a speed of upwards of 10 knots being obtained. The vessel then proceeded to Bridlington, where the visitors were landed, and the *Sudero* then steamed away for the fishing grounds.

## Miscellaneous.

**THE WORLD'S STEAM POWER.**—According to a recent publication of the Statistical Bureau at Berlin, four-fifths of the steam machinery in the world has been constructed within the last 25 years. France has 49,500 stationary boilers, 7,000 locomotives, and 1,700 ship boilers; Austro-Hungary, 12,000 stationary boilers, and 2,400 locomotives. In the United States the steam machinery, exclusive of locomotives, has 7,500,000 H.P.; in Great Britain, 7,000,000 H.P.; in Germany, 4,500,000 H.P.; in France, 3,000,000 H.P.; and in Austro-Hungary, 1,500,000 H.P. There are some 105,000 locomotives in the world.

**THE NEW RECORD PASSAGE OF THE "CITY OF PARIS."**—The Inman and International Co.'s steamer *City of Paris* arrived at Liverpool on August 14th, after completing the fastest passage on record from New York to Queenstown. The actual time occupied by the *City of Paris* in the voyage from New York to Queenstown was 5 days 23 hours and 38 minutes. She had previously performed the voyage outwards under six days, but the present voyage is the first occasion on which the trip home-wards has been done under six days. The log of the steamer shows remarkable uniformity in the daily runs. From 4.30 p.m. on the 7th inst. to noon on the 8th, she made 340 knots; to noon on the 9th, 446; 10th, 447; 11th, 460; 12th, 462; 13th, 463; and until her arrival at Queenstown, at 8.13 p.m. on the 13th, 174 knots. When it is remembered that a knot is about a mile and an eighth it can be understood how great the daily runs are, as on five consecutive days she made considerably over 500 miles per day. The *City of Paris* had about a thousand passengers on board, amongst whom there was much enthusiasm at breaking all previous records.

Mr. A. J. Davison, Superintendent of the Anglo-Australasian Steam Navigation Co., has been appointed by the Admiralty an honorary chief engineer in the Royal Naval Reserve.

On Thursday, August 22nd, a large steamer was launched at Trieste, and was named *Count Kalnoky*. The ship has been built for a Buenos Ayres shipowner.

The Hamburg-American Steam Packet Company's new steamer *Columbia* arrived on August 9th from New York at Southampton in six days 19 hours, thus beating her outward passage by two hours.

**Recent applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, from July 15th to August 17th, 1889.**

- 11316 S. J. Browning and B. Nicholson. Marine telegraph.  
 11333 P. A. M. Brunel. Mode of vessel propulsion.  
 11415 Clark (N. H. Bargfeldt and B. Lichtenstein). Signalling between navigable vessels.  
 11437 M. Mitchell. Perpetual motion.  
 11442 W. Menzies. Preservation of propeller shafts.  
 11475 T. W. Jeffries. Life-saving apparatus.  
 11523 T. W. Jeffries. Compasses.  
 11524 T. W. Jeffries. Correcting deviations of compasses.  
 11560 W. H. Harfield. Ship steering gear.  
 11582 G. Morgan. Boat lowering and raising.  
 11670 J. Gibson. Bell buoys.  
 11736 Jensen (D. Hudley). Compressing air for use with guns.  
 11744 Thompson (A. Heberle). Ships' logs.  
 11776 J. R. Steele. Ships' anchors.  
 11813 R. D. Ferguson. Hoisting, lowering, &c., of sails.  
 11822 J. Taylor. Propeller shafts.  
 11842 C. J. C. Hynen. Ships' fenders.  
 11854 J. W. T. Olan and J. A. Archer. Propulsion and manoeuvring of ships.  
 11884 Sir W. Thomson. Valves for water, steam, &c.  
 11926 J. C. Bull. Vapour, &c., engines.  
 11940 M. & H. Simpson. Ships' signal lamps.  
 12020 D. Taylor. Life-saving pillows and bolsters.  
 12038 L. Gathmanor. Ordnance.  
 12052 Thompson (W. S. Sylven). Watertight bulkheads.  
 12123 J. F. Flannery. Petroleum tank vessels.  
 12136 Et von Schmidt. Dredging machines.  
 12144 H. J. C. Keymer. Steam whipping winch.  
 12164 W. Ambler. Shells, shots, &c.  
 12167 W. Ambler. Castings for guns, &c.  
 12183 E. J. Preston & E. W. de Russell. Ships' water-closets.  
 12216 J. P. E. C. Stromeyer. Alloy for ships or boiler plates.  
 12217 J. P. E. C. Stromeyer. Alloy for resisting corrosive action of sea water.  
 12273 Keys (Schäffer and Büdenberg). Lubricators.  
 12280 J. B. Cullen. Ships' rudders.  
 12319 Dixon (J. Dixon). Dry docks.  
 12320 D. Thayer. Towing vessels over land or water.  
 12324 Thompson (J. Shaw). Ships' ventilators.  
 12326 Thompson (F. Binelli). Raising sunken vessels.  
 12341 A. J. Cooper & E. E. Wigzell. Taking sea soundings.  
 12401 G. Chupman. Propulsion of vessels.  
 12424 L. Vallet. Screw propellers.  
 12426 H. Lobdell. Propulsion of vessels.  
 12456 C. Kussmaul and J. Diamant. Obtaining motive power from action of tides.  
 12478 J. F. Lowe. Saving life from drowning.  
 12492 E. A. W. Dahl. Marine paint.  
 12512 J. Kirkaldy. Heating feed water.  
 12519 C. Frattini. Life-saving apparatus.  
 12563 R. M. Lowne. Electrical ships' logs.  
 12571 Thompson (E. Loze). Controlling speed of motors.  
 12583 C. Woodhouse. Stud chain cables.  
 12595 C. H. Leane. Raising sunken vessels.  
 12610 A. A. Govern. Utilization of tidal force.  
 12650 P. T. Harris. Lamps to be used on the surface of and under water.  
 12651 P. T. Harris. Rowlocks.  
 12691 J. Roberts. Ships' sails.  
 12732 A. Robertson. Ships' chairs.  
 12770 J. F. Hodgetts. Hulls of ironclads.  
 12786 E. G. M. Donnithorne. Reciprocating engines.  
 12824 J. Key. Supporting a person in water.  
 12841 M. Immisch. Motor and propeller shaft attachments.  
 12881 A. Mechan. Boats.  
 12899 C. Henderson. Collapsible boats.  
 12917 R. Stone. Propulsion of ships.  
 12928 T. E. Reynolds. Thrust blocks or bearings.  
 12933 W. Lundgren. Ascertaining vessel's position at sea.  
 12940 J. B. Cousins. Discharging ashes from ships' stoke-holds.  
 12955 A. Anderl. Facilitating propulsion of steam vessels.  
 13019 H. Barcroft. Propelling boats.  
 13024 R. Wright. Dredgers.

**BOARD OF TRADE EXAMINATIONS.**

Extra First Class.

July 27th. Rosser, Wm. D. Extra 1C Leith.

NOTE.—1 C, denotes First Class; 2 C, Second Class.

July 27th, 1889.

Amiot, Wm. R. 1C Liverpool  
 Barrass, Richd. 1C Sunderl'd  
 Burdon, J. W. 1C N.Shields  
 Flanagan, Hy. 2C Liverpool  
 Gradon, Saml. 2C N.Shields  
 Hoy, Hy. O. 1C Sunderl'd  
 Hunter, John 2C "  
 Irvin, Chas. 1C "  
 Jones, Wm. R. 2C Liverpool  
 Lewis, F. R. 2C Sunderl'd  
 Lidstone, J'kson 2C "  
 Matthews, Hy. 2C Liverpool  
 Mackey, R. P. 1C Sunderl'd  
 Mimro, Wm. W. 2C London  
 Perrett, James 2C Liverpool  
 Plenge, C. A. A. 2C Sunderl'd  
 Rogers, Jos. G. 1C Liverpool  
 Sayers, C. 1C Sunderl'd  
 Smith, John T. 2C N.Shields  
 Storey, Geo. 1C Sunderl'd  
 Fasey, Wm. 1C "  
 Welson, John F. 2C "

August 3rd, 1889.

Amos, Albert 2C N.Shields  
 Bell, Thos. A. 1C Glasgow  
 Clow, H. W. 2C "  
 Cocks, Chas. 1C Cardiff  
 Coper, Edward 2C Glasgow  
 Cruickshank, R. L. 1C Liverpool  
 Drew, John 1C Cardiff  
 Fletcher, A. C. 1C N.Shields  
 Hamilton, John 2C Liverpool  
 Hay, Alex. 1C "  
 Holman, H. G. 1C N.Shields  
 Hunter, John 2C London  
 Jackson, C. H. 1C "  
 Kincard, E. C. 1C Liverpool  
 Law, Geo. H. 1C Glasgow  
 McAllister, Wm. 1C "  
 McCallum, Angus 2C Liverpool  
 McDonald, Wm. 1C Glasgow  
 Morley, Thos. 1C N.Shields  
 Morrison, David 2C Glasgow  
 Nunes, Chas. E. 2C Liverpool  
 O'Brien, Wm. 1C Cardiff  
 Priestley, E. 2C N.Shields  
 Rees, Herbert 1C Liverpool  
 Ritchie, Rd. 1C Glasgow  
 Russell, W. H. 2C Cardiff  
 Sinclair, A. 2C Glasgow  
 Smith, David. 1C Liverpool  
 Spenceley, G. E. 1C London  
 Stephens, W. H. 2C Cardiff  
 Tobias, John R. 1C N.Shields  
 Vance, Robert 2C Liverpool  
 Walker, H. M. 2C Glasgow  
 Wells, Geo. 1C "  
 Williams, E. W. 2C Liverpool

August 10th, 1889.

Andlaw, W. F. 2C London  
 Anthony, D. R. 2C "  
 Baird, Joseph 2C Liverpool  
 Ballard, Wm. Hy. 1C "  
 Clegg, Fred. E. 2C N.Shields  
 Coombs, N. S. 2C Liverpool  
 Doron, Chas. 2C Greenock  
 Farrar, Jas. H. 2C Liverpool  
 Ferguson, Jas. 1C London  
 Fletcher, Wm. M. 2C Liverpool  
 Gray, John N. 1C Greenock  
 Hean, Wm. 1C Liverpool  
 Hood, John B. 2C Greenock  
 Humphreys, H. 2C Liverpool  
 Jones, Geo. 2C London  
 Kendall, H. 2C "  
 Kerr, C. 1C Liverpool  
 McKay, Donald 2C "  
 McMurdoch, D. 1C Greenock  
 McNair, Robt. 2C "  
 Nelson, And. A. 2C London  
 Oxford, Ben. G. 2C Liverpool  
 Payne, Robt. W. 1C "  
 Picot, P. J. 2C London  
 Pilling, Wm. F. 2C Liverpool  
 Reay, G. W. 2C N.Shields  
 Rust, John 2C Greenock  
 Scott, H. G. 2C N.Shields  
 Smith, Chas. 2C "  
 Spence, Jas. 2C London  
 Turnbull, Wm. 2C N.Shields  
 Wilkie, John D. 1C Liverpool  
 Williamson, J. G. 2C London  
 Wilson, J. T. 2C N.Shields  
 Wood, John 1C "

August 17th, 1889.

Adam, Stephen 2C Leith  
 Clayton, Wm. 2C "  
 Cooper, Thos. W. 2C London  
 Cribbes, Geo. 2C Leith  
 Dunn, W. M. 2C Liverpool  
 Fleming, Wm. R. 1C Dundee  
 Gunn, David 1C "  
 Jack, Wm. 1C Leith  
 Jamieson, Jas. 2C "  
 Laing, Geo. 1C "  
 Markwick, W. B. 2C W. Hartpl  
 McGavin, Thos. 2C Dundee  
 Mein, Jas. Hy. 2C Hull  
 Morgan, Josh. F. 1C Liverpool  
 Pearson, Wm. W. 2C Hull  
 Rae, Alex. 2C Leith  
 Rees, Wm. 1C London  
 Riley, Jno. S. 1C Hull  
 Saunders, S. H. 2C London  
 Wessenhagen, H. G. 2C Leith  
 Wyatt, Thos. 2C Hull

**TORPEDO GUN-VESSELS.**—The Admiralty have ordered preparations to be made at Sheerness Dockyard for building two new fast torpedo gun-vessels, to steam 21 knots. Their length will be 230 ft., and they will have a breadth of 27 ft., and a displacement of 735 tons. Triple-expansion engines, capable of developing 4,500 H.P., will be supplied. The armament will consist of two 36-pounders and four 3-pounder quick-firing guns, and five Whitehead torpedo tubes. The vessels are to have storage capacity for 100 tons of coal, which will be sufficient to enable them to steam 2,500 knots at a reduced speed of 10 knots.

## The Marine Engineer.

LONDON, OCTOBER 1, 1889.

A PROJECT for many years has been mooted for the construction of a channel between the Forth and the Clyde. It appears that this project is now taking practical shape. A Syndicate of gentlemen has been formed for pushing the matter to a conclusion. Plans have been prepared and submitted to the proprietors along the route, who would be affected by the engineering works. The country between the Firths of Forth and Clyde is eminently adapted to the carrying out of the proposed channel. The distance is short, not more than 25 to 30 miles, and without serious obstacles to the work. The proposed cost is from £1,500,000 to £2,000,000, which is exceedingly moderate for such an undertaking. The present channel has, in fact, been already constructed with the same point of view for a short connection between Glasgow and Leith and Edinburgh, but this permits the passage of vessels of no more than 8 feet draught. This channel is, therefore, useless for the present steamship traffic of large burden, nor would it suffice for the passage of even the smallest ironclads of our fleet. The military and naval aspect of the proposed channel is obviously as important to Great Britain as the commercial aspect, since there are present naval difficulties in the protection of the extensive coast of Great Britain with a comparatively small number of ironclads. Should, therefore, a fleet cruising in St. George's Channel, have news of an unexpected invasion of an enemy's fleet, the Eastern coasts of Great Britain would obtain by the service of such a canal excellent facilities for the transplanting of the fleet in very short time from the Western to the Eastern coasts. The shortening of the route also between Leith and Liverpool, for instance, will be reduced by 420 miles, and between Glasgow and London and Rotterdam and the Baltic ports, by 300 miles. The coasts of the new canal would be closely adjoining the present canal, which may have to be bought up. The capital of the proposed Company is put at about £7,000,000, and it is estimated that a tonnage of 10,000,000 tons would pass through the canal in the first year. Should by any chance the English Channel be closed, or become dangerous in case of a war with France, there is at present no cross water-way from East to West, or West to

East, by which ironclads could be transferred, except by the tempestuous and dangerous Pentland Forth.

THE adoption of torpedo boats in modern navies is becoming more marked from year to year. The British Admiralty have for the present fixed upon two standard types for first and second class boats. The one commanded by Prince George of Wales, during the Naval Review, is the first sample of this first class standard boat. They are to be 130 ft. in length by 13 ft. 6 in. beam. They are constructed of galvanised steel, and propelled by triple-expansion engines, indicating about 1,150 H.P. Their average speed is from 22½ to 23 knots. It will be seen that these boats present many improved features in comparison with those constructed some three or four years ago; the stipulation by the authorities being then only a speed of 19 knots for a period of two hours, carrying a load of 10 tons, while the present boats actually give from 3½ to 4 knots more during a run of three hours with 10 tons greater load. In spite of the difficulties that have been experienced with locomotive boilers, these torpedo boats, as built by Messrs. Yarrow & Co., are provided with locomotive boilers, and we believe this type of boiler has given complete satisfaction in the hands of Messrs. Yarrow & Co. We have no doubt the immunity from breakdown in these boilers is due to the excellence of the materials and workmanship. Another excellent precaution which is embodied in these boats is enclosing the fire-box or furnace of the boiler in a complete watertight case. The value of this invention is to prevent a sudden rush of water from extinguishing the fire, the air for the furnaces passing over the top of the casing and down to the grate. It has been found that on the sides being pierced, so as to flood the stoke-hole, the boat can run 50 miles without further stoking, as the water is prevented from putting out the fire. The crew is accommodated in the fore part of the vessel; a capital compartment is provided for two engineers, and for the officers aft of the boilers. The armament is one torpedo gun for direct ahead fire in the stem of the boat, and near the stern is provided a turn-table, on which are placed two torpedo guns for side fire. The manœuvring power of these boats is very marked, as they can turn in a circle, the radius of which is very little in excess of the length of the boat. Another point of precaution against foundering by perforation of the sides, is that all bulkheads

throughout the boat are watertight, and without an opening or door of any kind in them; thus there is no danger of the boat being caught unawares with any opening or communication through which the water may pass in consequence of the bulkheads being accidentally open when in action. The standard for the second class boats is 60 ft. in length by 9 ft. 3 in. in beam, and has a guaranteed speed of 16 knots for a period of two hours, carrying four tons, and their engines are capable of indicating about 200 H.P. A large number of visitors were invited by Messrs. Yarrow & Co. to examine some samples of these first and second class torpedo boats, who were greatly pleased with the satisfactory performance of the boats.

THE U.S. Navy is being now rapidly pushed forward, and fresh tenders are being asked for, for the construction of the three 2,000-ton cruisers for which contracts could not be obtained. The requirements are now slightly modified; six months more time is offered, making the contract period two-and-a-half years. The maximum speed required is also lowered from 18 knots to 17. The vessels are to be rejected if the minimum speed falls below 16 knots. The inability of the native shipbuilders to submit prices for the construction of the required cruisers within the limits of the appropriated sum by Congress, was a source of much regret to the U.S. Government, but they have taken the subject up again with determination and common sense. The lessened requirements for the 2,000-ton vessels as above ought to be successful in obtaining bids within the prescribed limits, and it is hoped that equally successful modifications may be made in the 3,000-ton cruisers. When this new ironclad fleet has been constructed for the United States, we trust we shall see their representative war-vessels joining our own or other foreign squadrons, and thus enable so important a country to be more worthily represented than at present in matters of international interest.

THE question considered theoretically as to the present efficiency of a steam-engine as compared with the absolute standard of heat units developed by the combustion of its fuel, and also as compared with an engine constructed as theoretically perfect as possible, is occupying the most important attention at present from engineers and such Institutes as that of the Mechanical Engineers. There is, however, much

difference of opinion amongst engineers and scientists as to what practically constitutes a real basis for comparison in the shape of a theoretically perfect engine. It is, of course, admitted that a large percentage of heat is never converted at all into steam, but escapes up the chimney of a boiler, and similarly, owing to what is called latent heat in the conversion of water into steam, a large proportion of the heat absorbed by the water can never be recovered, but passes away as waste heat in the condensing water. Due allowance for these and other unavoidable losses attaching to steam-engines and boilers, allows the construction of an ideal steam-engine subject to these disadvantages, and which may thus be considered a standard engine to which actual engines in use ought to approximate in duty. A series of tests as to the performance of the marine engines of the *Meteor* have been carried out by Professor Kennedy, and others, on behalf of a Research Committee of the Institute of Mechanical Engineers, with the broad result that the efficiency of these engines is only 54.6 per cent. as compared with a perfect engine, working between the same limit of temperature, and receiving the same quantity of heat per minute, and with only an absolute efficiency of 16 per cent. This is a poor record as compared with what might be, but at a discussion upon the case in point, there seems so much difference of opinion as to what really constitutes an ideal, but at the same time a practical standard engine, that engineers as a body cannot be much enlightened as to the importance of the result unless there were an actual standard engine in actual existence.

## THE CORROSION AND FOULING OF SHIPS.\*

### ANTIFOULING COMPOSITIONS.

By MR. HOLZAPFEL, NEWCASTLE-ON-TYNE.

THE invention of a means for protecting the bottoms or immersed parts of ships against fouling, and the worm in the case of wooden ships, and subsequently against fouling and rust in the case of iron ships, has long occupied human ingenuity. The Phœnicians over 2,000 years ago already employed a composition consisting chiefly of asphaltum for this purpose, and relics of the ancient Romans prove that they employed lead and copper sheathing on the immersed parts of their ships. Before iron shipbuilding was introduced, as early as the middle of the 16th century, an antifouling composition was patented in this country, but after the invention of yellow metal, compositions in the form of paint were seldom used till iron shipbuilding necessitated the use of a paint or composition to protect the iron against rust and fouling. Hardly a month now passes in which one or more

\* Read at the Meeting of the British Association in Newcastle-on-Tyne, Saturday, September 14th, 1883.

patents are not applied for under the name of "Antifouling Compositions." This is a proof that the desire to invent a means for preventing the fouling of iron and steel ships occupies many minds. It is therefore surprising that there should be an almost total absence of literature on this subject, and that a perusal of mostly all the specifications which are filed from month to month should prove, that even many of those who may be supposed to have given a great deal of time to the study of this subject, should, to judge from their specifications, appear to be quite unaware even of the most elementary principles on which alone a successful antifouling composition can be based. In 1867, this subject was dealt with at considerable length by Mr. Charles F. T. Young, C.E., who gives the results of a number of important experiments by the British and French Admiralties and others, but who deduces from them the most conflicting and illogical theories.

At this year's meeting of the Institution of Naval Architects, Professor Lewes read a short paper, the outcome of a very exhaustive and painstaking research, but even he seems hardly to grasp the subject and to misinterpret some of the phenomena.

With our daily extending fleet of iron and steel ships, this question continues to grow in importance, and I will therefore endeavour to lay down the broad principles on which a successful antifouling composition should be manufactured.

The way to obtain this object is to imitate as nearly as possible the action of copper and yellow metal. When iron ships were first introduced, great difficulty was experienced to apply any substance which would even in a measure preserve the iron and prevent fouling for a reasonable period. Dry dock accommodation at foreign ports then was exceedingly limited, and a vessel could only be drydocked after the return from her voyage. A man-of-war on commission in foreign or colonial waters, for an extended period would, before she came home and before she could get cleaned, become so foul as to be almost unmanageable and unseaworthy. What the Government and private shipowners hoped to attain at that time was a composition or material which could be applied to iron or steel ships and which would last for two, three or four years without being renewed. Many of the various patent compositions, whose manufacturers professed that they would achieve such a result, proved themselves entirely inadequate and barely lasted six or eight months. Others, besides fouling very rapidly, also corroded the iron to an alarming extent. In consequence of this, scientific and practical men endeavoured to introduce a method by which copper, yellow metal or zinc sheathing could be applied to iron ships. Such methods did exist and are occasionally even now resorted to, but they could only be carried out at very great expense and at comparative loss in speed. The method adopted is to cover the iron under water part of the ship with wood sheathing, 1 to 3 inches thick, and to nail the copper or yellow metal over this. There is, however, this drawback, that water is very liable to penetrate between the wood and iron skin of the vessel, and thus to cause corrosion, which remains undetected till the wood covering is removed. Moreover, the wood covering has to be fastened to the ship by iron or copper bolts, which in either case serve as a contact between the iron hull of the vessel and the copper sheathing, thereby setting up galvanic action, which is highly destructive to the iron hull of the ship.

Mr. Young, in the work above referred to, recommends, as the outcome of his experience and studies, to fasten zinc sheathing to the ship without an intermediate sheathing of wood. The fact that this method is out of use at present, although it was exhaustively tried, completely disposes of it.

The building of drydocks in all important harbours of the world, and the rapidity with which vessels are now cleaned and painted, have made it unnecessary to have a composition which will stand as long as yellow metal. In any case it has been found desirable to dock ships at least once in twelve months to sight bottom, and therefore a composition which will keep a ship's bottom clean for twelve months in ordinary trades is at present likely to meet with the best success. It must, moreover, comply with the following conditions:—

Firstly.—It must absolutely protect the ship against rust.

Secondly.—It must have a very smooth surface, so as to reduce surface friction to a minimum.

Thirdly.—It must be quick-drying, so that if necessary a steamer may receive two coats in one day.

Even if in a composition, drying more slowly, better antifouling properties could be introduced, it is very doubtful

whether such a composition would prove a commercial success, because the frequent chafing of our huge iron ships against piers, small craft, and anchor, chains, &c., removes considerable quantities of composition from the ship's bottom, and thus exposes the iron to the action of the salt water, and it has been found absolutely necessary to re-coat once in twelve months for this reason alone.

It is not difficult to make a composition which will in ordinary trades preserve the vessel against rust where she is not chafed, and against fouling for such a period, unless she is exposed to exceptional delay in waters which are very productive of fouling matter.

Now, as to the antifouling properties, there are two methods by which they are supposed to be obtained:—

Firstly, *exfoliation*, i.e., the separating of small particles of the composition from the main body, by which any animal or vegetable growth which may have attached itself, is caused to drop off the bottom of the vessel, and

Secondly, the *poisoning*, by which the fouling matter is supposed to be killed either before attaching itself or after. Some scientific and practical men attribute the antifouling properties of copper, yellow metal, and zinc sheathing solely to exfoliation, others to the poisoning principle only.

Mr. Young belongs to the former category, and Professor Lewes, without distinctly saying so in his paper, strongly leans in that direction. Both and all are, in my opinion, wrong, for it is only from the fact that copper and yellow metal *only* poison when they exfoliate that they become antifouling, and it is only metals and compositions which in exfoliating produce poisons that are effective antifoulers. Mr. Young, as well as Professor Lewes, gives instances in his paper of cases where the galvanic action of the salt water on the copper has been neutralized by iron and zinc protecting bars, and where consequently a great deal of fouling was found on the copper. They both say that when the copper ceased to exfoliate it ceased to be antifouling, and they try to deduce from this that it is only the exfoliation which is wanted, not the poisoning. My argument is this, that when the copper exfoliates, it produces a poison (oxychloride of copper) which is highly destructive to the lower animal and vegetable life, and that this poison is the *active antifouler* which kills the fouling matter before it can attach itself. Now, if the exfoliation of copper alone prevents fouling, why does not the exfoliation of metallic iron also prevent fouling? I may say that it does so to a very limited extent, but not because it exfoliates, but because, by coming into contact with salt water, the surface of the iron plate is transformed into rust, which also is to some extent poisonous, but not sufficiently to prevent fouling in any but the coldest climates. Now, I think everybody present will bear me out that an iron plate when exposed to the action of salt water for four years will lose at least five times as much of its weight, i.e., will suffer five times as much exfoliation as a copper or yellow metal plate; if, therefore, exfoliation were the real and true factor which prevents fouling, iron itself should be a much more effective antifouler than copper.

Some people may argue that the success often obtained from the use of zinc white and tallow, which cannot be considered in themselves highly poisonous substances, is a proof that after all exfoliation if not the only, is still an important factor as an antifouler. But zinc white and tallow when in contact with salt water become highly poisonous, and their chief merit lies in the poisoning principle. If a mixture of pure vasiline, mixed with chalk, were applied, the exfoliation would be equally good, but I need hardly say that the coating would quickly be covered with fouling matter to such a thickness as to stop the progress of exfoliation altogether. Exfoliation can only act as an antifouler in regard to substances which adhere lightly to a ship's bottom, not in regard to shell which seem to eat into the protective coating till they finally find a firm hold on the bare iron. I may, therefore, say that exfoliation is not an *active factor* which prevents the adhesion of animal and vegetable life, but a passive agent, which may under circumstances cause the formations which have already adhered, to again detach themselves from the ship. For in dealing with the first developments of animal and vegetable life, which constitute fouling, we have not a body heavier than water, which if it does not find a sufficiently hard hold to keep on the ship, would fall off by itself, but we have a hungry and most insidious animal or plant, which will live on anything that is not an active poison.

The poisoning principle is therefore this, that the antifouling

substance must surround the ship with a thin layer of poisoned water, which destroys all animal life that enters it; and you cannot poison an animal unless it absorbs some poison. So this poisoned zone gets gradually absorbed, and must be replaced. This replacement is effected in copper sheathing, as well as in antifouling compositions, by a gradual dissolution of the main substance which, in being dissolved, becomes highly poisonous. Mercury, copper, arsenic and zinc, in certain forms, are the substances mostly used for compositions, and they must be used in a varnish which will dissolve with sufficient rapidity to admit of these substances continually combining with salt water, and at the same time with sufficient slowness to retain part of them for the length of time for which the vessel will be exposed to the influence of fouling. We may now take it as granted that a successful antifouling paint must contain a considerable amount of poison which will destroy animal and vegetable life in its lowest developments; and that this paint must slowly dissolve, or corrode, or, if you like, exfoliate. Whether these poisons are poisons in the ordinary acceptation of the word, or not, does not matter, they must merely be poisons to the class of animals and vegetables which try to attach themselves to a ship's bottom, and they must carry the greatest possible efficacy in the smallest possible volume; and, as already stated, these animals and vegetables must be poisoned in their first stages of development, in which only they try to attach themselves to a ship or other solid substance, for when they have once attached themselves they grow rapidly, and can stand a great amount of various sorts of poisons, which is evidenced by the fact that a mussel can thrive on a quantity of *verdigris* which would poison a healthy man, also by the fact that large-sized shells several inches long are not infrequently seen on copper sheathing where they could not fail to absorb a large amount of poison from surrounding parts of copper. It will be seen, therefore, that even copper is not a perfect antifoul when exposed to trying circumstances; when, for instance, animal and vegetable life in the surrounding water is so strong that all the small particles of poison get absorbed, and before new formations of poison can take place the animals attach themselves to the ship.

Now when they have once attached themselves the poisoning factor generally becomes useless, the animals grow, and the ship comes home foul, often to the astonishment of the owner, captain and composition manufacturer, and this not only occasionally takes place with the best compositions, but also with copper and yellow metal.

I referred above to preparations of mercury, copper, arsenic and zinc. All of these are supposed to cause corrosion of the iron, particularly copper, which consequently should not be used at all, or only to a very limited extent. But in each case the antifouling coating should be separated from the iron by a coating of anticorrosive paint. Many years ago red lead was taken for this purpose, but it has now been almost completely displaced by quicker drying and more protective varnish paints, which should be so constituted that even if they are exposed to the action of the salt water their dissolution would be so slow and gradual as to be almost imperceptible. Many vessels of the Mercantile Marine have such a solid and hard body of these protectives on their bottom that absolutely no rust can be seen on them except on places where the paint is chafed off. As to the antifouling, or second coating, I have already stated that the varnish conveying the antifouling ingredients should be so constituted as to allow of a gradual but very slow dissolution in salt water, so as to set the antifouling or poisonous matter free. Now in varying waters varnishes of various hardness may be used; in the tropics a soft and rather quickly dissolving varnish; in Northern waters a hard and slowly dissolving varnish.

In an experience of over ten years, I have absolutely satisfied myself that most mercurial varnish paints on competitive trials will invariably show a better result than any other compound, while the preservation of the iron and the smoothness of the surface are unequalled. These paints, moreover, are so cheap, and dry so rapidly, that the total expenditure of a steamer for docking, cleaning and painting during four years is considerably less than a single outlay for docking and sheathing with yellow metal, which under favourable circumstances will only last the same period, i.e., four years. It seems to me very doubtful whether a composition lasting longer than 12 months, provided it were dearer than those now in use, would meet with favour, because most shipowners are already under an obligation to their underwriters or the Board of Trade to dock their vessels at least once in 12 months (which, moreover, is desirable in

order that these cocks, propeller, rudder, &c., may be inspected), and the cost of antifouling paint, if intelligently bought, is a very small one indeed. The tendency, on the contrary, seems to be to economize further in the cost of the paint, and to dock the ships more frequently, for the prices for dock dues and labour for painting, and the time required for this purpose, are in most parts only one-third or one-fourth of what they were 15 years ago, while the additional speed of a newly-cleaned and painted bottom is a great desideratum. The only improvement, therefore, which may be looked forward to might be the substitution of mercury by some cheaper substance, which would be at least as destructive to fouling matter as mercury. I foresee no chance of a compound being invented which would be hard enough to withstand chafing, and which could at the same time be used to convey sufficient antifouling materials in a suitable and effective manner. All we can therefore expect from the immediate future is comparative perfection within the radius in which we now move, i.e., a perfect adjustment of the various gums used in preparing the varnishes and of the various antifouling materials now known, so that the composition may be quite reliable even in cases where the various paints now used sometimes fail to fully answer their purpose.

## INSTITUTE OF MARINE ENGINEERS.

A MEETING of the Institute of Marine Engineers was held at the Laſſſthorne Rooms, Broadway, Stratford, E., on Monday evening, September 2nd, presided over by Mr. Wymer, Senior Engineer Surveyor, Board of Trade, London District.

Mr. W. J. CRAIG read a Paper specially for the Junior Section, entitled, "Scientific Triunities."

Preliminary to the subject matter of his Paper, the author referred to the Paper on Pressure, read by Mr. J. McFarlane Gray, at a previous meeting, from which he and those who were then present had derived very great pleasure and profit. The present Paper and its title was an outcome of thought induced by Mr. Gray's Paper and remarks on the evening in question.

The title of the Paper called for some explanation, the literal meaning taken for tri-unity being unity, under three aspects or divisions.

In order to discover how far the theory of three divisions, or aspects of unities extended, the age of the Pyramids had been searched, and had repaid the seeker after three in one and one in three with several illustrations. Beyond the age of the Pyramids to the days of the first known shipbuilder in the history of the world, and beyond him again to the time of chaos, if time it can be called, before time began on this earth, each and all yielded examples of tri-unities. The earth itself, we read in the most ancient of books, was formed in three periods of time: First, the light separated from darkness; second, the firmament; third, the separation of land and water.

In geological science the divisions of the crust of the earth may be said to be three in number; so also of the divisions in astronomical, botanical and other sciences. The science in which members and visitors present were presumably most interested, mechanical science, is not without many examples of triunities. The mechanical forces, for instance—the lever, the wedge, and the wheel—each of these, in turn, being capable of sub-division into three kinds, as in the case of the lever, of the first, second and third kind.

Mr. Craig referred to the subject of education, discovering even in this examples of what gave rise to the title he had chosen for the opening Paper of this Session. The 3 R's, once, at least, the School Board rallying cry; the rule of three, the peculiarities which may be traced to the figure 3 itself, were all remarked upon.

The way in which man made himself known to his fellows was alluded to—by his words, his actions, and his writings.

In concluding his long and carefully written and suggestive Paper, Mr. Craig impressed upon the younger members and graduates to be diligent students, not only of what lay directly in connection with their work as engineers, but of the allied sciences, in which they would find great pleasure and mental profit. The Paper was illustrated by several well executed diagrams.

Mr. M. PRIOR, while questioning the strict accuracy of some of

his remarks on astronomical science, as considered in the light of the most recently accepted theories and observations, expressed himself as much pleased with the result of Mr. Craig's painstaking and study.

Mr. ROWE could not quite accept one or two of the deductions referring to the formation of the earth itself and the Solar System, as he considered them rather at variance with the Nebular Theory of Laplace, now generally supported by scientific authorities. He, however, agreed that Mr. Craig had given his hearers a Paper which was well worth listening to, and would, no doubt, be productive of much good.

Mr. HAWTHORN made a few remarks, and expressed himself surprised that the author of the Paper had been able to find so many trinitities. The title was very suggestive, and many other trinitities following on the lines laid down by Mr. Craig would no doubt suggest themselves to others as to himself, even keeping within the limits of the engine-room, starting from the process of filling the boilers, coaling the bars, and getting up steam.

The CHAIRMAN expressed himself well pleased to be in the position he occupied that night in response to the invitation conveyed to him by the Hon. Secretary, and hoped that the Institute would go on and flourish. He pointed out that Mr. Craig evidently wished to impress upon the Juniors that there was an abundant field for them to study in, and he wished to endorse this, and expressed his own strong conviction that a very grave mistake was made in allowing young engineers just out of their apprenticeship to go to sea. They ought to be more proficient in the rudimentary principles and knowledge of the uses of the various details before being intrusted with the charge of a watch in the engine-room. He hoped the Juniors would all have an opportunity of reading the Paper carefully.

The HON. SECRETARY, on rising to move a vote of thanks to Mr. Craig, expressed regret that those for whom the Paper was specially prepared had been silent; doubtless this was partly due to the presence of their Seniors. He proposed that another evening might be devoted to the subject matter of the Paper, and no doubt Mr. Craig would kindly spare them an evening.

While overhauling some old papers he had the previous evening met with an old University paper on "External Perception." In that the conclusion he had arrived at was somewhat different to a theory which Mr. Craig had advanced at the outset, his own conclusion in the paper being that things are not what they seem to be, i.e., taking the eye as the organ of perception, our knowledge of things visible is unreliable. As a proof of the truth of this, he would only refer to an incident of the evening. Mr. Craig, as an illustration, showed the small model piston he now held in his hand. This, he stated, anyone who was acquainted with such things could tell at a glance was a Buckley piston. He would now remove the cover, and it would be observed that it was not a Buckley piston at all, but a common one.

The removal of the junk ring, concealing in part the internal part of the piston, caused considerable amusement.

The vote of thanks was seconded by Mr. SHOREY, and heartily responded to.

Mr. CORBEO moved a vote of thanks to the Chairman for his kindness in coming among them, and for the interest he had manifested in the Institute, which was now incorporated and registered as a legally recognised Society.

The vote of thanks was most heartily responded to, and the proceedings terminated with an intimation from the Chairman that the Syllabus of Papers before him was made up from the 2nd September to 23rd February, 1890, the next Paper being by Mr. R. Bruce, on Radial Valve Gear, on Tuesday, 24th Sept., followed by another by Mr. Jos. Williams, on Forced Draught, on Saturday, 19th October.

**THE RUSSIAN MERCHANT NAVY.**—The development of the Russian merchant navy in the Black Sea is being pushed forward with an energy equal to that displayed by the Imperial Navy there. But unfortunately for Russian interests, the shipbuilders on the Baltic and the Black Sea are not yet able to compete with foreign shipbuilders, despite the extremely high protection duties. The Black Sea merchant navy will shortly be increased by the addition of a large steamer of 4,000 tons from Sweden, for the petroleum traffic to India, and of two steamers built in England at a cost of £60,000 each. A duty of £10,000 will have to be paid for each of these steamers.

## THE PARIS EXHIBITION, 1889.

### NAVAL ARCHITECTURE & MARINE ENGINEERING.

#### II.—TYNESIDE FIRMS.

**L**EAVING the Retrospective Exhibition of Work, and proceeding to the Palais des Machines, we find that space has been found in the gallery, and in that part assigned to Great Britain, for a number of stands devoted to the models of naval and mercantile vessels, as well as to miniature representations of specialities in the equipment of vessels, photographs of vessels and of machinery, &c., besides a number of pleasure rowing boats and miscellaneous exhibits. There are also on the floor of the Palais des Machines several exhibitors' stands containing objects of interest to our readers, including quadruple launch and yacht engines, &c.; but in this series of articles only a passing notice will be given to such exhibits as we think worthy of illustration and fuller description, such as the large and exceedingly well-arranged stand of the Leeds Forge Co., the exhibits of Messrs. Simpson, Strickland & Co., of Dartmouth, the Farnley Iron Co., and others, to which we devote special articles.

Confining our attention to the exhibitors whose stands are to be found in the gallery of the Palais des Machines, first on the catalogue of Great Britain we find the world-wide known Sir William Armstrong, Mitchell & Co., Limited. At the onset we must frankly acknowledge our surprise at the paucity of the exhibits (there is only one!) forwarded by this company. It would not have been surprising to have had to record that the largest show of armament, ammunition, &c., for war vessels was that of the Tyneside concern, nor that in number and variety of naval architectural exhibits they surpassed all rivals. It is not, however, our duty to surmise as to the reasons that have actuated British firms to ignore, or barely recognise this great exhibition. Although Sir William Armstrong, Mitchell & Co., Limited, are only represented by one model, it is very completely finished, and of the highest class and most recent design, viz., that of the lately completed cruiser, *Piemonte*, built at the Elswick shipbuilding yard to the order of the Italian Government.

In our May number, on page 42, we gave the leading particulars of this vessel's hull and machinery, and, as we shall probably give an illustration of this notable craft in an early number, a brief reference must now suffice. It is five years since Sir Wm. Armstrong, Mitchell & Co. first entered the lists as constructors of this special class of vessel, and in which they were veritable pioneers. Then in the Chilean cruiser, *Esmeralda*, a speed of 18 knots was attained, with engines of 6,500 H.P., on a displacement of 3,000 tons. Subsequently in the Japanese vessels of the same class, the *Naniwa* and *Takachiko*, with increased displacement—3,650 tons—and somewhat increased engine power, 7,250 to 7,500 I.H.P., a speed of 18½ knots was realised. Later still, in the Chinese cruisers, *Chih-Yuen* and *Ching-Yuen*, with less displacement—2,300 tons—and less propelling power, the engines only indicating 5,500 I.H.P., the speed of 18 knots per hour was repeated; while now in the *Piemonte*, with only 2,500 tons displacement, a speed of over 21 knots has been attained, but requiring upwards of 11,000 I.H.P. We submit that, however those facts may be discounted, that, after making all allowances, they are evidence of great progress in naval architecture and marine engineering, possibly more in the latter than in the former, seeing how great has been the advantage accruing from the adoption of the triple-expansion type of engines. It must not, however, be overlooked that the great improvements in the designing and manufacture of rapid-firing guns, whereby much heavier and more effective weapons of this type have been brought into existence, is also no small factor in the progress attained. As already indicated, the model of the *Piemonte* is complete in every detail, and although a solitary, still a worthy, representative of the Elswick department of Sir William Armstrong, Mitchell & Co., Limited.

There are only three of the Tyneside shipbuilding and engineering firms represented at the Paris Exhibition, and the second we notice is Palmer's Shipbuilding & Iron Co., Limited, of Howden and Jarrow. At the stand of this company we have a large number of exhibits, and within the space occupied there is a fairly effective representation of the immense resources and constructive capabilities of this gigantic concern. As is tolerably well known, Palmer's Shipbuilding & Iron Co., Limited, carries on all the operations requisite to convert

raw materials into completely equipped sailing and steam vessels of all classes for mercantile and war purposes, procuring a large quantity of their raw materials from their own mills. It is nearly a quarter of a century since the company was formed by the acquiring of the established business of Messrs. Palmer Bros., a firm which started operations in 1852, building the first screw collier, the *John Bowes*, in that year; and, rapid as was the development of the concern in the earlier years of its history, the same enterprise still continues to be exhibited; and its latest phase is evidenced at the Paris Exhibition by the model of the belted cruisers that are being built for the Spanish Government by the Astilleros de Nervion, a combination of Senor Martinez Rivas, of Bilbao, and Palmer's Shipbuilding & Iron Co., Limited.

The model of these Spanish vessels may be said to be the principal exhibit at this stand, not only because the construction of these vessels mark a great departure in the shipbuilding policy of the Spanish Government, and that ultimately Spain may become a shipbuilding country, but because of the intrinsic merit of the designs of which the model is a representation. Without entering into full details of their construction, it may be stated that on the centre line, forward and abaft of the engines and boilers, there are two turrets, carrying the heavy guns, besides which there are placed at the sides of the vessel ten rapid-firing guns, about 6 in. calibre, and sixteen lighter guns for resisting boarding and torpedo attack. The model shows all unnecessary wetted surface has been dispensed with; and although, probably, the dimensions of the hull may not be in any way better adapted for high speed than the dimensions of the belted cruisers built at Jarrow, on the Clyde, and elsewhere for the British Government, still, as 4,000 additional I.H.P. is being provided in the engines of the Spanish vessels, the speed of 20 knots at sea does not appear to be over estimated.

The leading dimensions of the vessels now under construction at Bilbao are: Length, 340 ft.; breadth, 65 ft.; and depth, 38 ft. As already indicated, these dimensions are not by any means identical with those of the *Orlando*, *Undaunted*, &c., but in the length show an increase of 40 ft. and a breadth of 9 ft. Probably such large increases were unavoidable, as the increase of displacement to 7,000 tons as against 5,000 tons in the British belted cruisers will have been necessitated by the increased weight of engines, boilers, &c. It would have been interesting if a departure in war-ship marine engineering had been made in these vessels, viz., the adoption of quadruple-expansion engines, with boilers of 200 lbs. pressure; but possibly this next step in the development of marine engineering in war-vessels may be made by the British Admiralty; and, if it be not already decided upon, it should not be too late to fit at least one of the many vessels to be built within the next few years with engines of this type as powerful as the *normal* displacement would allow, and thus the actual benefit or otherwise derivable from quadruple over triple-expansion in vessels of otherwise exactly similar construction would be demonstrated, provided the engines and boilers were as far as possible, excepting the additional cylinders and working pressure, of similar design.

(To be concluded in our next.)

## PASSENGER STEAMSHIPS OF BRITISH RAILWAY COMPANIES.

### THE GREAT WESTERN RAILWAY COMPANY.

THE passenger steamers of the Great Western Railway Co. are run between New Milford and Waterford, and also, between Weymouth and the Channel Islands.

On the New Milford and Waterford service there are four steamers and three on the Weymouth and Channel Island service. The trains in communication with the former service leave Paddington station daily at 5.45 p.m., and arrive at New Milford at 1.45 a.m. They depart from that port at 2, and arrive at Waterford at 10.15.

On Monday a ship leaves New Milford at 7 a.m. after the 7.15 p.m. train from Paddington on Sunday. We Waterford at 5 p.m., arrive at New Milford part thence at 2.45 and reach Paddington at 10.15 morning, however, passengers proceed from

New Milford by the 8.55 or 10 a.m. train. A steamer leaves Waterford at 7 a.m. on Sundays in connection with the 5 p.m. train from New Milford.

As regards the Channel Islands service, a train leaves Paddington at 9.15 p.m. reaches Weymouth at 1.48 a.m., leaves there at 2.30, arrives at Guernsey at 7.5 and at Jersey at 9.15 daily, Sundays excepted. On the return voyage a steamer leaves Jersey at 8 a.m., and Guernsey at 10.20, and arrives at Weymouth at 3 p.m. A train also leaves the last mentioned port at 4.10 p.m., and reaches Paddington at 8.40, except on Sundays.

The following particulars give the dimensions, tonnage, speed and passenger accommodation of the company's steamers and by whom they were built and engined, viz.:

Name of Steamer.	Length, Feet.	Breadth, Feet.	Depth, Feet.	Tonnage Gross.	Passenger Accommodation			Speed.	Built by	Engined by
					Saloon.	Fore Cabin.	After Cabin.			
Milford .....	250.6	29.25	15.2	912	225	276	—	13	W. Simons & Co.	W. Simons & Co.
Waterford .....	251.4	29.2	15.2	911	231	287	—	13	"	"
Limerick .....	251.8	29.2	15.2	914	226	238	—	13	"	"
Pembroke .....	254	30.9	15	927	198	360	—	16	Laird Bros.	Laird Bros.
Lynx .....	235	27.5	14	880	240	—	273	17	"	"
Antelope .....	235	27.5	14	880	240	—	273	17	"	"
Gazelle .....	235	27.5	14	880	240	—	273	17	"	"

The four first-mentioned ships are paddle and the remaining three twin-screw steamers. All these boats are usually driven at full speed between the ports. While each of those on the Waterford service are provided with several sleeping cabins, a ladies' room, and a smoking room, the *Lynx*, *Antelope* and *Gazelle*, which are new steamers, are of the best type for fast

cross channel service, and have the most recent and best accommodation for passengers.

By the kind permission of the general manager of the Company our representative was allowed to examine the *Lynx*, which is of the same type as and has similar accommodation to the *Antelope* and *Gazelle*.

This steamer has very fine lines and a yacht-like appearance. Two bilge keels have been fitted, about 10 ins. deep, to diminish rolling in heavy seas, and between them and the keel itself two stout lengths of bilge keels are fitted. The stern, stern-framing and keel are of iron, and the plating is of steel. An opening is cut in the deadwood aft, like that in single-screw ships, to permit the twin-screws to revolve in areas which extend beyond the midship longitudinal vertical plane. The after end of the vessel being very fine, the propeller shafts extend a considerable distance from the hull, and are supported at the after ends by brackets rivetted to the after framing. The stem is perpendicular, and the stern elliptical. She has two masts carrying light fore-and-aft sails and two funnels. She may be described as a flush-deck ship, with a "monkey" poop, long bridge-house, occupying the full breadth of the steamer and topgallant forecastle.

As regards the objection often urged against twin-screws, that in docking and undocking they are liable to be fouled by ropes and that the blades are likely to come in contact with the quay, this objection has been almost entirely got rid of by building the steamer with an ordinary screw aperture in the deadwood, and placing one propeller in advance of the other, whereby their blades overlap.

Each of these steamers are constructed with seven watertight bulkheads, dividing the ship into eight complete compartments, and with any two of these in communication with the sea the steamer would still float. In such merchant ships it is seldom that the subdivision is carried out so far, and it is properly said that intending passengers may regard these boats as practically unsinkable. Aft the collision bulkhead is worked a watertight flat, extending to the next bulkhead, whereby a ballast tank is formed, which is used for trimming the ship according to trade requirements. In the afterpart of the fore-hold a ballast tank is provided for the same use. The after peak can also be used as a ballast tank if necessary. Consequently whatever cargo may be carried it is always a simple matter to keep the steamer at any desired trim.

As auxiliaries to the Navy during war the *Lynx* and her sister ships would be very appreciable, and especially as despatch boats, their small dimensions and great speed, superior engines, forced draught fittings and capacity for carrying a large quantity of coal in proportion to the tonnage, render them eminently suitable for such work.

This steamer is fitted with two sets of triple-expansion engines, having cylinders of 16½, 26 and 41 ins. diameter, by 30 in. stroke. Her indicated H.P. is 1,700; piston rods, connecting rods and eccentric rods are all of steel. Ordinary double-bar link motion is used. Piston valves are fitted to H. and I. cylinders, while the L.P. cylinder has an ordinary balanced slide. The reversing gear is of the ordinary screw motion worked by hand. So well also are the parts balanced that a man can with one hand easily and quickly run the links over. The air and bilge pumps are worked by levers off the H. and L. P. cross-heads. Allen & Co.'s "Conqueror" centrifugal circulating pumps are fitted and are independently driven; their blowing engines are also fitted in the steamer. Tangye's "duplex" feed pumps are supplied for feeding the boilers from the hot well. The condensers are of the ordinary kind, and are carried on the back columns of the engines. All the machinery is simple, and of great strength.

Steam is supplied by two steel, cylindrical single ended boilers, each 14 ft. 6 in. by 10 ft. Each boiler has three of Purvis's furnaces. The working pressure is 150 lbs. to the square inch. The total grate area is 118.5 square feet. Forced draught on the closed stokehole system is used, the air pressure in the stoke hole being kept at ½ in. Two of Allen's engines are fitted in the fan room to drive the fan, each 6 ft. 4 in diameter, to supply the forced draught.

The shaft passes through one chamber with watertight bulkheads. A watertight door is fitted to the after engine-room bulkheads. Therefore, while the Board of Trade requirements are more than fulfilled, the space thus enclosed materially increases the safety of the ship. Ordinary thrust blocks had been fitted, and so efficiently had all the bearings been adjusted that no water was required to keep them cool. The crank and propeller shafting are of steel. The propellers have four

blades, and are cast solid in Manganese bronze, the diameter of each being 9.6 ft., with a pitch of 15.3 ft. The entire blade area of each propeller is 70 square feet. On the preliminary trial of one of these steamers cast-iron propellers of exactly the same dimensions were used, but by substituting those of Manganese bronze a gain of more than three quarters of a knot in speed was reached.

The electric light plant of each ship consists of a "Westminster" dynamo driven by Willan and Co.'s patent central valve engine, fitted with their patent centrifugal governor, and working at a pressure of 80 lbs. per square inch. The lamps are run "in parallel," and the ship is not used as the return lead. The lamps are of 16 and 8 C.P., according to the location. Six group lamps are provided for working cargo at night. All the switches and cut-outs are of excellent design and make. The main switch-board is slate-based, and all the circuit-switches are of the double-pole type. In short, the electric light plant is extremely complete and compact. Very high insulation is used for the cables, and an approach to a breakdown is practically impossible. Excellent machinery of the most modern type exists for steering and working cargo.

The first-class saloon, first-class cabins, ladies' cabins, and smoke-room are in the bridge-house.

The first-class saloon is a very sumptuously decorated and furnished square room, and its appearance is all that can be desired in luxurious arrangements when seen as our representative saw it, brilliantly illuminated with the electric light and the table laid for supper. The artistic panels and ceiling decoration, fixed revolving chairs and seats, respectively upholstered in rich blue velvet, and the elegant carpet of this apartment, are very praiseworthy and cause it to surpass in attractiveness and comfort the highest expectations which may be formed even by those accustomed to luxurious saloons in small steamships.

At the end of the saloon there are three large square private cabins similarly decorated and furnished, and which, as well as the saloon, are ventilated by port holes. The saloon is further ventilated from a good skylight in the centre. It is warmed partly by a comfortable and artistic stove near the middle of the room, and partly by steam pipes under the seats.

There are also some superior ladies' cabins near the saloon, and also a very commodious smoking-room, which has an artistically-tiled floor.

Immediately below the saloon very comfortable sleeping berths are provided, several of these are in a large square room, and others in well furnished private cabins adjoining. Both the rooms and all the cabins are well illuminated by the electric light, and there is also electric bell communication in them, and the other apartments in the steamers which the passengers use. All these enclosures are also well ventilated, while the most satisfactory lavatory accommodation in connection with them has been provided. All the first-class accommodation is situate on the fore side of the engines and boilers, therefore any motion or vibration of the ship is least felt.

The second-class saloon and cabins are in the poop. Accommodation is here provided for about 140 passengers, and the fittings and arrangements made therein are very comfortable.

The ventilating arrangements of the steamers are very good, and the unpleasant smell of bilge-water will never be noticed therein. Ventilating trunks of an improved type are used throughout the saloons and apartments used by passengers, and it is by means of these mostly that efficient ventilation is obtained. On the trial trip of the *Gazelle*, Captain Lecky, the Marine Superintendent of the Great Western Railway Co., caused thermometers to be suspended in all the cabins, and there was no appreciable rise in the temperature to record even when the conditions were most favourable—when the wind was aft. In the first-class saloon and private cabins there is no smell of the engines, which to lady passengers especially, must be a great recommendation.

On the poop is the companion entrance to the second-class saloon, and abaft this way there are seats for the passengers. This accommodation is excellent, and is seldom to be found, even in the better class of ocean steamers.

The officers' quarters are in the forecastle, which are substantially furnished, while below them, on the main-deck, are the seamen's and firemen's quarters. The engineers' quarters, which surround the steam quartermaster, by Higginson, abaft the engine hatch, are also well-furnished and comfortable.

On the bridge-deck there is an excellent steam steering-house, a chart-room, and a large and luxuriously furnished Captain's room. The entrance to the first-class saloon is from this

deck. Such deck is also provided with a sanitary and fresh-water tank and two life-boats and two cutters. The boat-lowering gear is of the most efficient description, and the life-saving apparatus is far in excess of the Board of Trade requirements.

On the official trial of the *Gazelle*, on the 14th of August last, when four runs were made by her on the measured mile, the following results were attained:—

	TIME.		SPEED.	
	M.	S.	KNOTS.	
1st run..	3	15	..	18.46
2nd „..	3	51	..	15.48
3rd „..	3	20	..	18.00
4th „..	3	43	..	16.14

giving a mean speed of 17.04 knots. The time was just about high water, therefore the tidal influence is eliminated. The differences in the runs were owing to the strong wind and choppy sea. They, however, forcibly testify the great power of the steamer. It is properly said that the weather was so unfavourable for these tests that, had the ship been built for the Admiralty, the trials would have been postponed.

During the special trials of the *Gazelle* the mean revolutions of the engines were 120; mean steam pressure, 149 lbs. per square inch; air pressure in stoke-hole,  $\frac{3}{4}$  inch; and the mean I.H.P., 1,650 (both engines). The results of the trial speeds of the three steamers are as under:—

	<i>Lynx</i> .	<i>Antelope</i> .	<i>Gazelle</i> .
No. of Revolutions per Minute ..	121.22	122.05	120.00
I.H.P. .. .. .	1,702	1,667	1,650
Mean Speed .. .. .	16.50	16.79	17.04

Now, inasmuch as the contract speed of these boats was only 16 knots, Messrs. Laird are entitled to much credit for these results, which are highly appreciated by their owners.

In consequence of these steamers being fitted with the most efficient forced draught apparatus, they perform very fast voyages, and generally arrive at their ports considerably before they are due. The Deputy Marine Superintendent at Weymouth told our representative that although the time fixed in the tables for the voyages from Jersey to Weymouth is  $7\frac{1}{2}$  hours, these ships have performed them in six hours; while on one occasion the *Lynx* was propelled from Guernsey to Weymouth in the unprecedented time of 3 hours and 50 minutes. Owing to these splendid performances there has been an immense increase in the number of passengers between Weymouth and the Channel Islands since the steamers of the Great Western Railway Co. began to run on this route a few weeks ago. For the better convenience of passengers there has been an appreciable acceleration of the train service between Weymouth and Paddington, the trains of the company run alongside the steamer to and from the Channel Islands. A new passenger station has been provided for this purpose which contains excellent waiting rooms, a baggage room for Custom House examination of passengers' luggage, a booking office, &c., and other conveniences for passengers.

There is also good hotel accommodation near the quay, where the passengers embark and land, including the Marine, the Victoria and the Gloucester Hotels. Excellent through carriages are run by the company between Paddington and Weymouth.

#### THE LANCASHIRE AND YORKSHIRE AND THE LONDON AND NORTH WESTERN RAILWAY COMPANIES.

The Lancashire and Yorkshire and the London and North Western Railway Companies jointly run a good service of mail steamships between Fleetwood and Belfast, and both companies have arranged a commendable train service in connection with these ships.

The fine steamers on this route sail from Fleetwood to Belfast every evening except Sundays, at or after 8.30 o'clock, and arrive at Belfast about 6 on the following morning. They return from Belfast to Fleetwood every evening except Sundays at 8 o'clock, and perform this voyage in about the same time as the outward ones.

The steamer from Belfast is expected to reach Fleetwood in time for the first trains to all parts of England. Through carriages are attached to the first train, after the arrival of the boat to Preston, Bolton, Manchester and Liverpool, and to the 8.3 a.m. train from Fleetwood to Warrington, Crewe, Stafford, Rugby and London. The steamer from Fleetwood always waits for the trains due at 7.53 and 8.20 p.m., and on special days, as shown in the timetable, the train due at 10.45 p.m.

A good system of through-booking of passengers exists from Belfast to the principal stations on the Continent in connection with the Great Eastern Railway Co., the London, Brighton & South Coast Railway Co., the London, Chatham & Dover Railway Co., the London & South Western Railway Co., the South Eastern Railway Co., the *Baron Ory* steamer to Antwerp, the General Steam Navigation Co., the Netherlands Steamboat Co., and the North German Lloyds' Co. Second-class tickets, however, *via* Dover are not available by the Night Express Mail trains, while third-class tickets *via* Newhaven and Dieppe are only available by the night service.

Holders of second-class tickets can use the saloon cabin, and third-class passengers, by paying a small excess fare on board the steamers, can also use the saloon between Belfast and Fleetwood.

Parties of not less than four can have dinners provided by giving notice by telegraph or otherwise, four hours before the departure of the steamers from either side. All wines, spirits, and eatables supplied on board are of the best quality.

The trains at Fleetwood run alongside the steamers. Passengers and their luggage pass direct by a covered way between the train and steamers without charge. Superior refreshment rooms have been provided at Fleetwood new station. Good accommodation for passengers and their baggage is also afforded at Donegal Quay, Belfast.

The following particulars give important detailed information respecting the steamship service between Belfast and Fleetwood of the railway companies last-mentioned:—

Names of Steamers.	Dimensions and Gross Tonnage.	When and where Built, and by whom.	Description of Engines, Boilers, and Working Pressure.	Speed, and the rate usually driven from Port to Port.	Passenger Accommodation.	Saloons and Cabins and Cuisine Arrangements.	Electric Lighting.	Hotel Restaurant and Waiting-room accommodation therewith.
<i>Prince of Wales</i> ..	Length, 307 feet Breadth, 35 „ Depth, 16 „ Gr. Tn. 1428 tons	1886, Barrow By the Barrow Ship-building Co.	Two pairs Compound Diagonal Oscillating.	16 knots.	Saloon 936. Steerage 403.	1 gent.'s large saloon 1 lady's do. 20 gent.'s state cabins 13 ladies' do. 53 open berths Smoke-room on upper deck.	Throughout by Messrs. King, Brown & Co., Edinburgh.	
<i>Earl of Ulster</i> ..	Length, 275 feet Breadth, 30 „ Depth, 14 „ Gr. Tn. 1084 tons	1878, Barrow By the Barrow Ship-building Co.	2 Diagonal Compound Surface Condensing.	14½ knots.	Saloon 820. Steerage 397.	1 gent.'s large saloon 1 lady's do. 12 gent.'s state cabins 12 ladies' do. 58 open berths Smoke-room on upper deck.	By L. & Y. Railway Electrical Department.	
<i>Duke of Connaught</i>	Length, 267 feet Breadth, 30 „ Depth, 15 „ Gr. Tn. 1052 tons	1875, Barrow By the Barrow Ship-building Co.	2 Diagonal Direct Acting Compound.	14½ knots.	Saloon 846. Steerage 371.	1 gent.'s large saloon 1 lady's do. 12 gent.'s state cabins 12 ladies' do. 58 open berths Smoke-room on upper deck.		
<i>Princess of Wales</i>	Length, 260 feet Breadth, 30 „ Depth, 15 „ Gr. Tn. 1052 tons	1870, Hebburn. By Andrew Leslie.	Two Compound Direct Acting Diagonal Surface Condensing.	14½ knots.	Saloon 800. Steerage 393.	1 gent.'s large saloon 1 lady's do. 14 gent.'s state cabins 5 ladies' do. 60 open berths Smoke-room on upper deck.		Refreshment and Waiting-rooms under management of Railway Co. close to steamer's berth.

Of these steamers the *Prince of Wales* is fitted with diagonal oscillating, disconnecting, compound-surface condensing engines. The two high-pressure cylinders are 43", and the two low-pressure 77", and have all a stroke of 7 feet. The engines have separate stop valves, from the main steam pipe. Each pair has its own condenser, circulating feed and bilge pumps, complete, and worked entirely separate, coming in and going out of harbour or at sea when desired. The engines are supplied by steam at 85 lbs. pressure from four large double-ended boilers, with 24 furnaces in all.

*Earl of Ulster* and *Duke of Connaught* have two pairs of compound diagonal tandem engines. Their high pressure cylinders are 34" and their low pressure 64", with 6 ft. stroke. The engines do not disconnect, but are fitted with two separate condensers that can be connected. Each engine is fitted with a separate air pump and single-acting circulating pump. Each of these two steamers has also two large double-ended boilers, with six furnaces to each boiler. The steam is supplied at 70 lbs. pressure.

The *Princess of Wales* was fitted with new engines and boilers in 1884. The engines are diagonal, oscillating, disconnecting, compound-surface condensing. Their two high-pressure cylinders are 32", and their two low-pressure are 56", with a stroke of 6 ft. 6 in. This steamer has one large condenser and circulating engine. Each set of engines is fitted with a horizontal double-acting air-pump, feed pump, &c., for each engine, and has four single-ended boilers, each having three furnaces, the backs in each case being towards the engines. The steam is supplied at 70 lbs. pressure.

It will be noticed that the saloon and cabin accommodation of these steamers is very good, and suitable for the service in which the steamers are engaged.

## THE BRITISH ASSOCIATION AT NEWCASTLE-ON-TYNE.

ALTHOUGH it is not usual for the meetings of the British Association to be referred to in our columns, the bulk of the proceedings being out of our domain, yet, on the occasion of the Association holding its meetings at one of the leading marine engineering, shipbuilding, and shipowning centres of the United Kingdom, a brief reference may be fittingly made.

This is the third occasion on which the Association has visited Newcastle-on-Tyne, the former visits having been made respectively in August 1838 and 1863. Exactly a quarter of a century divided the first and second meetings, and a half century has been fully completed since the first visit. What changes have occurred in the meantime! In 1838 there was no iron shipbuilding on the North-East Coast. Only 1 ton out of 40 tons of British mercantile vessels was steam propelled. Now there are building on the Tyne district 150,000 tons of iron and steel vessels, on the Wear 140,000 tons, and on the Tees and Hartlepool districts about 128,000 tons. Now nearly half of the British mercantile tonnage is steam propelled. The development of the harbours of the North-East Coast during the half-century has also been phenomenal. Numerous docks have been constructed and harbours greatly deepened on the Tyne, the Wear, the Tees, and at Blyth and Hartlepool.

It is possibly to be regretted that on the occasion of the British Association making its head-quarters at Newcastle-on-Tyne, that the president for the year was not one of the great industrial leaders, or the workers in mechanical sciences. In 1863, Sir W. G., now Lord Armstrong, was fittingly the president, and if he had again occupied the chair intense satisfaction would have been given. Sir Isaac Lowthian Bell, who has been at this meeting the President of section B (chemical science), would also on Tyneside have been a very popular appointment as the president. However, it was not to be. Professor W. H. Flower was chosen, and has ably fulfilled the duties.

Amongst the opening addresses, that in the Section B, Chemical Science, by Sir Isaac Lowthian Bell, F.R.S., F.C.S., &c., was of special interest, reviewing as it did iron and steel manufacture in relation to chemistry. Down to the beginning of the seventeenth century, charcoal, his hearers were informed, was the fuel employed in the blast furnace, and generally in iron manufacture. In 1620, Dudley made several attempts to substitute mineral coal for vegetable fuel in his smelting works, timber having become very expensive, but

failed to attain success, and the British iron trade gradually declined until it was not equal to the production of one modern blast furnace. In 1740, however, Darby, by treating pit coal in the same fashion as the charcoal burners had done with wood, he, by charring it, restored vitality to an expiring industry; but the restoration was not great, for half a century later the weekly produce of a furnace did not exceed 16 tons. Reference was made to the improvements effected at the beginning of the century, to the discovery of Neilson of the value of heated air, and at a later date to the utilization of waste heat from blast furnaces for raising steam for blast and other engines, &c., so that in Great Britain alone the annual saving is fully equal to four million tons of coal. The recovery of ammonia in iron smelting was also referred to, and it was mentioned that Messrs. Baird, of the Gartsherrie Works, and others, are regularly thus manufacturing large quantities of ammonia sulphate. The manufacture of steel necessarily bulked largely in Sir Lowthian Bell's address. Apparently steel may have been known to the ancients, and certainly in 1556 a description of its manufacture was written by Agricola. Until 1865, practically the only process followed was that of cementation, although in 1856, a paper was read before the British Association entitled, "A mode of making iron without the use of fuel," by Henry Bessemer. The gradually attained success of the process, now world-wide known, of the last mentioned, was traced, as well as the Siemens-Martin and the Thomas-Gilchrist systems.

Turning to Section G, Mechanical Science, at which Mr. William Anderson, M.I.C.E., presided, we regret that our space does not permit of a lengthened allusion to his address. Having considered the molecular theory in several aspects, including the hardening and tempering of steel, allusion was made to petroleum. Its value as fuel, its convenience, cleanliness and economy in locomotive and marine work was pointed out, and also its value as a working agent in heat engines. As we intend at an early date to describe the Zephyr launches of Messrs. Yarrow & Co., as well as similar engines and craft constructed on the continent, a detailed reference is not now requisite. It is, however, exceptionally interesting to find the President of the Mechanical Section stating "Very signal success has been obtained by Mr. Yarrow and others in this mode of using mineral oil, especially for marine purposes, and for engines of small power. There seems to be no doubt that by using a highly volatile spirit in the boiler a given amount of fuel will produce double the power obtainable by other means, and at the same time the machinery will be lighter, and will occupy less space than if steam were the agent used."

Confining our attention to the Mechanical Section, the first paper read was by Mr. Beauchamp Tower on an apparatus for providing a steady platform for guns, search-lights, &c.

The apparatus consists of the platform, which is the part to be kept steady, and which is hung in gimbals. The steadying forces are applied by four cylinders attached to the platform, which push by means of rams at four external points. The action of these cylinders is controlled by a wheel revolving rapidly in a horizontal plane on a ball and socket bearing attached to and between the four cylinders. Water at 100 lbs pressure is pumped by a pumping-engine through the gimbals, which are made hollow for the purpose, and thence through a pipe on the platform to the ball and socket bearing of the wheel, which has a passage through it for the water to pass to a cavity in the centre of the wheel; from this cavity some of the water passes to tangential jets, which cause the wheel to revolve by their action at about 1,500 revolutions per minute. The remainder of the water issues from an axial jet which projects upwards from the wheel, and has opposite to it, and at a distance equal to about the jet's diameter, four ports grouped close together, and each connected by a passage to one of the four cylinders.

The wheel, being hung a small distance above its centre of gravity, settles itself down to revolve in a truly horizontal plane, and to throw a truly vertical jet out of the axial jet-nozzle. This jet striking on the four ports causes a water-pressure in the four cylinders, which pressure is equal in all the cylinders if the jet is truly concentric with the four ports; but, if it is not, one of the ports receives more of the jet than the others, and the cylinder connected to it has a greater pressure, and consequently pushes harder than the others, and pushes the platform over till the ports and axial jet are concentric. The axial jet thus forcibly compels the platform to be co-axial with it. The object and advantage of this arrangement is, that while the wheel acts powerfully on the platform

it suffers no reaction on itself, and no matter what disturbing forces are brought to bear on the platform none of them can affect the wheel.

The wheel, revolving in a horizontal plane, and hung a short distance above its centre of gravity, is in reality a long-period conical pendulum having a period of about 90 seconds, and is analogous to Mr. Froude's wheel which he used for recording the rolling of ships. This was a pendulum whose period was longer than that of the waves, so that it might be undisturbed by the wave forces. The author has experimented with this apparatus at sea for a considerable time, and has overcome the usual practical difficulties and brought the apparatus to a high state of perfection.

The apparatus is also applicable for controlling swinging-cabins, and experience with it seems to justify the belief that the abolition of the angular movement alone would prove a great mitigation of sea-sickness.

This paper had a very favourable reception, the principal speaker in the discussion being Captain Noble, of the firm of Sir G. W. Armstrong, Mitchell & Co., Limited, who considered that the apparatus might be found to be very useful in naval launches, &c. Subsequent to the reading of the paper it transpired that the Admiralty are about to experiment with Tower's apparatus for mounting machine guns.

The remaining papers on the 13th inst. were without interest to our readers. On the following day two papers were read. The first was Mr. A. R. Liddell's, on "Ships for the Carriage of Petroleum," which, however, was of a very brief character, and conveyed no information that has not been previously widely circulated. It provoked more discussion than might have been expected, but partially this was owing to the contracted limits of the paper, and also to the strictures passed by the author on Lloyd's Register of British and Foreign Shipping for not having encouraged the construction of the first oil in bulk steamers, whereas the surveyors of Bureau Veritas had done much to help forward the new industry.

Professor Jenkins, of the Naval Architecture Chair at Glasgow University, expressed the opinion that the construction of steamers of the oil in bulk type would continue with great activity on the rivers Tyne and Clyde. Referring to the steamers *Vaderland* and *Nederland*, built by Palmer's Ship-building and Iron Co., Limited, as early as 1872, for the trade, but never actually engaged in carrying petroleum, the Professor stated that the reason was that the owners desired to have a passenger certificate, which the United States authorities declined to grant to a vessel carrying petroleum in bulk.

In the paper reference had been made to the sailing ship *Hainaut*, built at Barrow-in-Furness two years ago for the oil in bulk trade, but this was by no means the first instance of the kind, a sailing ship having been built for the trade in 1864. Indeed, at the end of last century, Russian sailing vessels carried petroleum in bulk on the Caspian Seas, but being constructed of wood, not with satisfactory results.

He criticized the illustrations shown by Mr. Liddell, which depicted Swan's double bottom type of oil steamer, and said that the fitting of ballast tanks under the oil tanks was not now the practice on the Clyde, nor yet on the Tyne, he believed, the ballast being carried in some of the oil tanks.

The portion of the paper referring to Lloyd's Register of British and Foreign Shipping was, he said, much to be regretted. It must be due to a misapprehension of the duties of a classification society, which occupied a very important position as between shipowners and underwriters. The latter expected that their interests would be carefully protected, and it would never do to rush into all kinds of new speculations. New schemes must be tested to show that they were reliable. Petroleum in bulk steamers having been successfully constructed and worked, they were now approved by the Committee of Lloyd's Register, and a great number were now being built under their survey.

Mr. Chas. Hawkey, M.I.C.E., suggested that valves should be placed near the bottoms of the divisions of the different compartments, which, being opened during the operation of loading and discharging, would permit the oil to flow equally into all compartments. Professor Jenkins said the valve arrangement would inevitably lead to the vessel capsizing. It might also have been pointed out, that frequently petroleum of different qualities is carried and must not be mixed.

A member asked what fuel was used in oil in bulk steamers? and another member related the experience of using discharging pipes which had been internally coated with Angus Smith's coal tar and resin. Instead of the petroleum being "water white" it was the colour of "pale sherry." He reminded en-

gineers and shipbuilders that when petroleum was carried, paint or protective compositions on the interior of oil compartments were unnecessary, the petroleum having protective not corrosive tendencies.

Several other queries were made, and amongst the contributors to the discussion was Mr. A. C. Holzapfel, who recalled the fact that the *Petrolea* built at Motala, in Sweden, was carrying oil in bulk in the Mediterranean before the Tyne-built steamer *Gluckaaf* was completed.

In replying, Mr. Liddell stated every drop of petroleum should be pumped out of oil compartments, and this was as far as possible effected by placing the pump suction low down. No one should enter a compartment in which petroleum had been stored with a naked light, Davy's safety lamps should be used. The largest tank compartment in a steamer for carrying oil, he remembered, was 36 ft. long, 40 ft. broad, 20 to 22 ft. in depth—usually they did not exceed 20 ft. in length.

Petroleum, he believed, was not used as fuel in over-sea steamers, as its cost was greater than coal in the United Kingdom, and supplies could not be obtained at every coaling station.

The subject of the second paper was "The Corrosion and Fouling of Ships, and Anti-fouling Compositions," and it was read by the author, Mr. Max Holzapfel. The following is a brief summary:—

"After referring to the work published in 1867 by Charles F. T. Young, dealing with different trials made by the British and French Admiralties and others, and to the paper at this year's meeting of the Institute of Naval Architects by Professor Lewes, the author states that to obtain a successful antifouling composition the action of copper and yellow metal should be imitated as closely as possible.

"In the time of the wooden sailing vessels copper or yellow metal sheathing was employed with very good results, and it is still so employed, lasting under ordinary circumstances for three or four years, and keeping vessels clean for that period. When iron vessels were first introduced, sheathing with yellow metal, zinc plates, and other metallic compounds were tried, but all failed. Many compositions were then brought into the market, but when practically tested they were found to be inadequate, lasting barely six months.

"What the Government and private shipowners then aimed at was a composition to last as long as copper sheathing on wooden vessels. The building of dry docks, however, at all the important ports in the world, and the rapidity with which vessels are now cleaned and painted, have made it unnecessary for a composition to last for such a period, particularly as it is now always considered advisable to dock vessels every twelve months.

"A composition which will keep a vessel clean for twelve months in ordinary trades is at present likely to meet with the best success. It must, however, comply with the following conditions:—

"1st. It must absolutely protect the ship against rust.

"2ndly. It must have a very smooth surface, so as to reduce surface friction to a minimum.

"3rdly. It must be quick drying.

"As to antifouling properties, there are two methods by which they are supposed to be obtained:—

"1st, exfoliation, i.e., the separating of small particles of the composition from the main body, by which any animal or vegetable growth which may have attached itself is caused to drop off the bottom of the vessel; and, 2ndly, poisoning, by which the fouling matter is supposed to be killed either before attaching itself or after.

"Some lean to the former principle, others to the latter. Mr. Young attributes the antifouling properties of copper and zinc sheathing to exfoliation only, and Professor Lewes, without saying so distinctly, leans strongly in that direction. Both, in the author's opinion, are wrong; for it is from the fact that copper and yellow metal only poison where they exfoliate that they become antifouling, and it is only metals and compositions which in exfoliating produce poisons that are effective antifoulers.

"After adducing several facts in support of his theory at length, and quoting the poisons mostly employed by antifouling composition manufacturers of the present day, he concludes by saying that any improvements in the immediate future in composition can only be effected by a perfect adjustment of the various gums used in the preparation of the varnishes employed in the manufacture of antifouling compositions with the various antifouling materials employed, so that the com-

position may be quite reliable even in cases where the paints now used sometimes fail to fully answer their purpose."

As the members were anxious to take part in some of the various excursions arranged for the afternoon, the discussion was brief and unworthy of the importance of the subject, and the care with which the subject had been studied by the author and treated in the paper. Mr. Holzapfel in reality presented the results of ten years close and accurate observation as a successful antifouling composition manufacturer and that without in any way departing from a truly scientific treatment of the subject. There is no doubt that his paper will long remain one of the—if not the—standard contributions to the literature on the question of fouling and corrosion of seagoing vessels.

In the discussion, Professor Jenkins deplored the immense loss which shipowners entailed by the corrosion and fouling of vessels' bottoms and quoted an instance of a new steamer having within four months thereby suffered a great diminution of speed, viz., from ten to seven knots. He referred to the use of mechanical ship-cleaners, the proposal to use celluloid, and concluded with emphasizing the great national importance of the question.

The President of the Section, Mr. Wm. Anderson, said they were indebted to Mr. Holzapfel for having pointed out the principles which it was necessary for successful antifouling and anti-corrosive compositions to comply with, and proposed a vote of thanks, which was carried by acclamation.

No less than seven papers were read in the Mechanical Section on the 16th inst., but only one, that by Professor G. Forbes, on "Electric Launches on the Thames," had any elements of interest to our readers. In this paper it was claimed that taking size and accommodation into consideration, the electric launch was cheaper than the steam launch, and that without doubt in the course of a few years the steam launch as used to-day on the Thames, would be entirely abolished. The result would be inevitably the survival of the fittest, and the electric launch would reign supreme. It was free from the objections of smoke and oil, and was much better fitted for the comparatively small speed allowable on the Thames by reason of the traffic. There would require to be a sufficient number of charging stations on the river, but these would not necessarily be numerous, as he had found accumulators were not exhausted in forty hours.

We are not inclined to quarrel with the views of Professor Forbes, no doubt the field of electric-motors will gradually widen. Little or no discussion was evoked by this paper.

The Mechanical Section concluded its labours on the 17th inst.

A discussion on blast furnaces, opened by Sir Isaac Lowthian Bell, President of the B Section, commenced the day's proceedings, both the chemical and mechanical sections being expected to take part, but the after speakers were few and brief. Next Sir Douglass Galton discoursed on "The Water Railway," in the discussion Sir Frederick J. Bramwell "did not think the elements of commercial use were in this scheme."

The next paper on "The Strength of Alloys at apparent Temperatures," by Professor C. V. C. Unwin, F.R.S., was of greater interest.

In the paper, the results of numerous experiments carried out by the author were given. The materials tested included rolled bars of gun metal, yellow brass, Muntz metal and Delta metal, as well as cast brass. The latter gave fairly regular results, the bars of gunmetal showed less regularity, but possibly this was owing partially to their being of two separate castings. A peculiarity in the influence on the ductility of the bars was observed. With Muntz metal the decrease is regular, and there is still considerable elongation before fracture at a temperature of 650° Fahr.: with yellow brass (rolled) the decrease is more rapid, and there is very little elongation before fracture at temperatures above 500° Fahr. Cast brass behaves in the same way. The elongations of gun-metal bars were very irregular, and at temperatures of 600° Fahr. and upwards the elongation was very small. On the other hand, in the case of the Delta metal bars, the elongation increased regularly with the increase of temperature.

A communication on "An Automatic Stoker," by M. Godillot, and a paper on "The Hopcraft Furnace," were also amongst the proceedings of the closing day of the mechanical section, but call for no comment.

## THE PROTECTED CRUISER "BARHAM."

ON September 11th there was launched the *Barham*, the keel-plate of which was laid on No. 3 slip at Portsmouth on October 22nd last year. The weight of hull, when completed, will be 1,050 tons, and of this 713 tons had been worked into the structure. The *Barham* is one of two third-class protected cruisers designed by Mr. W. H. White, Director of Naval Construction. She is similar in several respects to the four third-class protected cruisers of the *Blonde* type, one of which is the *Barrosa*, recently launched. The principal difference between the two types is that the *Barham*, being intended for service on the Channel, Mediterranean, or similar stations, have only the usual steel bottom plating, while the *Blondes* have in addition a thickness of teak covered with copper sheathing, so that, fouling being retarded by these means, they can be employed in distant waters where dock accommodation is either limited or non-existing. In other respects the *Barham* may be described as the *Barrosa* lengthened by some 60 ft.; and as the extreme breadth of the two ships is identical, the former has much the advantage in fineness of form. The increase of displacement of 250 tons, which has necessarily accompanied the increase of length, has been partially utilised in the carrying of engines of greater horse-power. Combined with the superior fineness of form, this greater engine power is expected to give the *Barham* a maximum speed of 19½ knots, as compared with the 16½ knots of the *Barrosa*. The former measures 280 ft. between perpendiculars, and 85 ft. in extreme breadth, and has a displacement of 1,830 tons at a mean draught of 13 ft. 8 in. A watertight protective deck extends throughout the length of the hull, completely shutting off all frames and bulkheads below from those above, which are connected with the deck by bracket plates and angle steels. The protective deck is about 20 inches below the load water-line forward and aft, but rises higher amidships, where it forms a sloping deck at the sides and ends of the machinery spaces. The coal is also arranged so as to afford additional protection over this deck. As few openings as possible are made, but where such are unavoidable, they are fitted with armour shutters or gratings of the same strength as the deck. Further security against shot and shell has been afforded by a longitudinal middle-line bulkhead being continued throughout the greater part of the vessel's length, and by numerous transverse and longitudinal watertight bulkheads, subdividing the structure into small compartments. An oval conning-tower, composed of rolled steel plates 3 inches thick, gives some amount of defence against small gun-fire to the various steering and engine-room telegraphs, voice-pipes, directors, and steam steering wheel. The whole of the steering gear is placed beneath the protective deck, and can be worked either by hand or steam. The armament will consist entirely of quick-firing and machine guns, viz., six 4·7 inch 45-pounder and four 3-pounder quick-firing guns and two Nordenfeldt guns. The vessel is also fitted with two torpedo tubes. The machinery contractors, Messrs. Hawthorn & Co., are to supply two sets of engines of the triple-expansion type, taking steam at 150 lbs. pressure from six boilers of the locomotive pattern. They are to realise a collective I.H.P. of 3,500 with natural draft, and of 6,000 with forced draught, under which conditions a speed of 17½ and 19½ knots respectively is expected to be attained. The normal supply of coal is 140 tons, which it is estimated will carry the ship 2,600 knots at a speed of 10 knots. The total estimated cost of the vessel is £296,524, and £4,984 for guns.

## TORPEDO BOAT TRIALS.

THE British Admiralty have, for the present at all events, fixed on two standard types of torpedo-boat, first and second class, and on Saturday, September 14th, Mr. Yarrow invited a number of gentlemen to see three of these boats, one first-class and two of the second-class. The first-class boat was the last of six which, with ten second-class torpedo boats, will complete the last Government order intrusted to Messrs. Yarrow & Co., of Poplar. This boat is 130 ft. in length by 18 ft. 6 in. beam, and, with her sister boat, is built mainly on the lines of the well-known torpedo boat No. 79, which was the one selected to be placed under the command of Prince George of Wales during the Naval Review and recent manoeuvres. All

these six boats have been tested by the Admiralty authorities, and on a run of three hours' duration without stoppage, the speeds attained have varied from 22½ to 23 knots. In comparing these boats with those constructed during the scare, some four years since, it is interesting to note that the old boats were stipulated to have a speed of 19 knots during two hours, carrying a load of ten tons. The present boats give from three-and-a-half to four knots more during a run of three hours with ten tons greater load. These results represent the advance that has been made in torpedo boat construction during the last three years. The trials of these boats show that an equal advance has been made in steering efficiency and rapidity of manœuvring, which points are almost as important as that of speed.

With regard to the second-class boats just tried, they were two—the sixth and seventh—of ten which Messrs. Yarrow have on the point of completion for the British Government. These boats are modifications of No. 50, which was constructed two years ago by the firm. They are 60 ft. in length by 9 ft. 8 in. beam, No. 50 having a beam of 8 ft. 6 in. only. The increased beam gives additional seaworthiness. The armament of the new boats has also been modified, as they carry two torpedoes instead of one. These torpedoes are fired in the direction in which the boat itself is travelling, the steersman thus practically aiming the torpedo, and this is capable of accomplishment by reason of the rapid steering now attainable by the special form of rudder used. The armament of the boat is further increased by a 3-pounder machine gun. These boats have a guaranteed speed of 16 knots over a two hours' run, carrying four tons. They are intended to serve as tenders to the large ironclads, and are not only to be used as torpedo boats, but also for the general service of the ships to which they are attached. Their lifting weight is about 12 tons, and they are decked from end to end. The engines are of the triple-expansion type, and are capable of indicating about 200 H.P. There are small cabins forward and aft, and the boats are in all respects a marked improvement upon previous craft of this class. Although they have a much greater beam they have a speed of half a knot more than the older boats, which were really not safe at sea in rough weather. Like other craft of this description, they are built throughout of steel. These vessels may be considered as the standard type of second-class boats to be adopted in future in the British Navy. Both the first and second-class boats behaved excellently well during the runs as regards both speed and manœuvring capabilities.

The table below shows the particulars of the last trial, which gave the highest speed:—

Steam.	First Receiver.	Second Receiver.	Vacuum.	Air Pressure.	Revolutions per Minute.	Speed.	First Means.	Second Means.	Mean Speed during Three Hours Loaded with 20 Tons.
lb.	lb.	lb.	in.	in.		knots.			
166	65	17	23	2.56	402	20.000	23.043		
167	65	16½	23	2.46	410	26.086	23.098	23.070	
166	65	17	23	2.50	408	20.111	23.005	23.051	
164	64	16	23	2.28	407	25.899	23.005	23.005	23.032 knots.
165	65	16	23½	2.46	401	20.111	23.005	23.005	
165	65	16	23½	2.60	408	25.899	23.005		

## PARIS EXHIBITION.

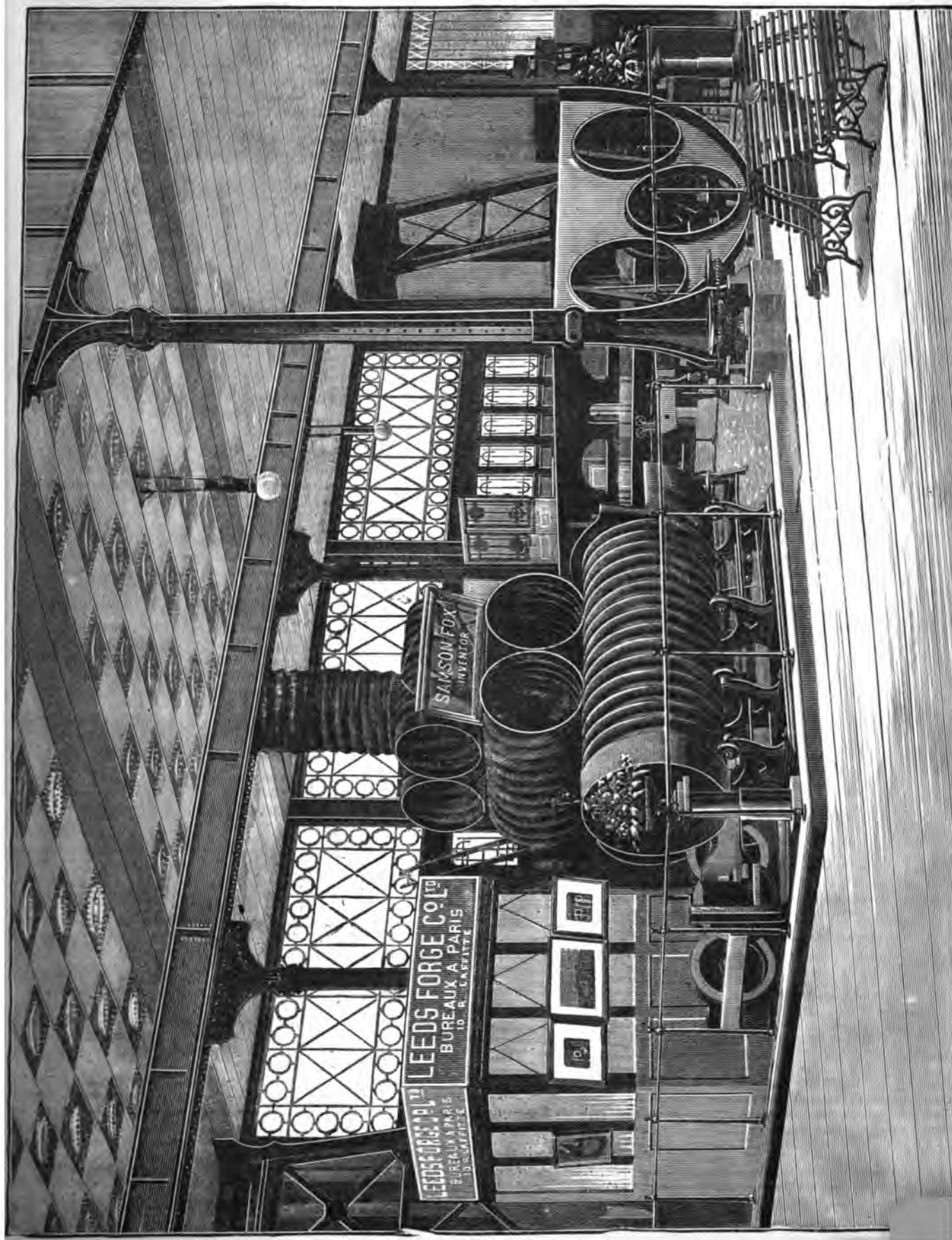
THE LEEDS FORGE COMPANY, LIMITED.

THE Leeds Forge Co., Limited, is one of the few important exhibitors of special interest to marine engineers, who have spared no pains or expense to have a display in keeping with the great magnitude of the Exhibition.

In our full page illustration (page 265), we have reproduced a photograph showing the front view of the stand, which is enclosed with brass railing, mounted on marble coping, and is luxuriously carpeted throughout. A column supporting the gallery of the Palais des Machines, divides into two portions our view of the various exhibits, and immediately to its right, in the foreground, is a marine boiler front plate, with three flanged openings to receive furnaces of 3 ft. 6 in. diameter, the diameter of the boiler being 15 ft. The material employed in this and all the remaining exhibits of the Leeds Forge Co., Limited, with one solitary exception, is Siemens-Martin mild steel of one uniform quality, made at the company's own works at Leeds, each cast being analysed, and each plate tested to withstand a tensile strain of 26 tons per square inch, with an elongation of 25 per cent. in 10 inches. The manufacture of these marine boiler front plates is effected in a press capable of exerting 5,000 tons by hydraulic pressure spread over the whole surface at the same moment, all the flanges being completed at one operation, and at one uniform heat. Many hundreds have been supplied of various sizes and thicknesses.

On the left hand, in the foreground, is one of Fox's corrugated furnaces, No. 20,895—the latest that had been made prior to the opening of the Exhibition. It is of the type supplied to the French Admiralty, having, as it will be seen from our illustration, the lower part extended to form the bottom of a combustion chamber, and is placed on rollers, so that it may be turned round and inspected from all sides. It is 10 ft. 6 in. long, 3 ft. 6 in. in diameter, and is constructed of ½-in. Siemens-Martin steel plates. The perfect character of the welding is a specially noteworthy feature in this, as well as of all Fox's corrugated tubes. The process of welding before the plates have been corrugated, it can be easily perceived, is one demanding great care, and it is doubtful whether such good results are obtainable by any other means than that adopted by the Leeds Forge Co., who solely employ water-gas for heating the parts to be welded by hydraulic power to bring the parts together, and automatic travelling hammers to complete the process. A flue of full length is by this means welded in 45 mins., so that economy of time as well as efficiency is obtained. There can be little doubt that much of the success of Fox's corrugated furnaces depends upon the care with which the welding operation is conducted. At all times this process requires great attention, but especially when the material to be manipulated is mild steel, as it would be manifestly absurd to employ high class material of 26.5 tons tensile strain, with 27.5 per cent. elongation in 10 inches, the actual results obtained from tests of the flue in question, if there were any possibility of a fault in the weld.

**A FINE SCREW HOPPER DREDGER.**—The Directors of the Manchester Ship Canal Co. have ordered a four-screw hopper dredger of 850 tons capacity. The order has been placed with Messrs. Simons & Co., Renfrew, and besides being fitted with their patent traversing bucket, it will have a number of important improvements. The engines will be two sets of triple-expansion, of the most modern type. This dredger will be similar in many respects to the dredger that this firm built two years ago for the Bristol Corporation.



The most imposing feature of the Leeds Forge Co.'s stand is the trophy formed of seven of Fox's corrugated flues, which towers to nearly the floor of the gallery.

It is formed of three pairs of flues, varying in diameter from 4 ft. 8 in. to 2 ft. 6 in., and with corresponding variations in length, laid upon each other transversely, on the front of the third pair the name of their inventor, Samson Fox, being prominently displayed. Surmounting these three pairs of flues, is the seventh, 9 ft. in length, standing on one end. Now-a-days, it is unnecessary to point out the advantages arising from the adoption of corrugated furnaces, but it should not be forgotten that the resistance to collapse obtained by their adoption was no mean factor in the development of the triple and quadruple-expansion engines. Had there not been a solution of the problem, how to obtain a reliable furnace without unduly increasing weight, the use of high-pressure steam in marine engineering might have been indefinitely retarded. Not only, however, was this problem solved by Mr. Samson Fox, but at the same time the reliable furnace was obtained without increasing the thickness of the plates, and with an increase in steam-producing properties.

Historically interesting in this connection, is the first corrugated flue ever made, which is placed behind the office. Alike in its dimensions and in the formation of the corrugations, it is a marked contrast to the Fox's corrugated flues, so widely and extensively known. The flue is only 3 ft. 6 in. long, and 2 ft. 9 in. diameter, and  $\frac{1}{4}$  in. in thickness, and the corrugations lack the uniformity and finish so characteristic of all Fox's flues. It should, however, be pointed out, that the original corrugated flue was formed from the best Yorkshire iron, and that Fox's corrugating mill, for rolling plates hot to form flues of true cylindrical shape, now employed by the Leeds Forge Co., was not then in operation. Crude, however, as this early example of a corrugated flue may now appear, it from the first attracted attention, and at the Paris Exhibition in 1878 received an Award of Merit, and it is also accompanied with two gold medals. Now, upwards of 3,000 steamers have their boilers fitted with this speciality.

In front of the trophy of corrugated flues is the date of the present Exhibition, 1889, of floral design, forged by hand from Siemens-Martin steel. Four large floral bouquets, of the same material and manufacture, are also distributed about the stand in prominent places.

Besides the exhibits already pointed out, which are of peculiar interest to our readers, a pair of combustion chamber plates should also be mentioned. They are constructed for three furnaces each of 3 ft. diameter, the front plate being  $\frac{1}{4}$  in. thick, and the back plate  $\frac{1}{2}$  in. All the flanges on these plates are formed at one operation, and at a uniform heat, and as the plates, after flanging, are allowed to cool gradually, they are in this way annealed, and the original quality of the material is maintained.

Amongst a number of miscellaneous exhibits one dished plate, flanged for a receiver end, 4 ft. diameter,  $\frac{3}{8}$  in. thick, is noteworthy, as, instead of being concave, it is convex.

Two manholes for boilers, 17 in. diameter, formed under hydraulic pressure, one piece, out of flat plate  $\frac{3}{4}$  in. thick, are welded to the metal, and

without reducing the thickness at any point, one of them cut in two pieces to demonstrate the accuracy of the flanging, &c., should not be overlooked.

The remaining exhibits are not of primary interest to marine engineers, but as a large portion of the stand is devoted to exhibits illustrative of the application of steel in the construction of railway rolling stock, a brief glance at the various objects is not out of place.

It is only comparatively of recent date that the Leeds Forge Co. commenced the construction of solid flanged steel framing for locomotives, tenders, and waggons, and already these specialities have been widely adopted. On the extreme right hand of our illustration (page 265), looking through the flanged opening for the right wing furnace, the reader will see Fox's solid flanged steel underframing for waggons, as adopted on the Belgian State Railways. Not a single angle bar is employed in its construction, all connections are made by means of flanged plates, while the advantages as compared with timber framing, with its numerous braces, hoops, bolts, knees, &c., of iron, are manifest. So that the visitor may not overlook these advantages on the stand of the Leeds Forge Co., an ordinary waggon underframe is placed contiguous to the solid flanged steel underframing, showing at a glance the relative bulkiness and weakness of construction of timber framing for waggons as compared with the new steel frame. The simplicity of construction of the latter is self evident, and owing to the duplicating of parts as far as possible, and to their all being made by hydraulic pressure in dies, no expensive labour is requisite in erection, but merely ordinary drilling and rivetting.

Several other exhibits of a similar character are also on the stand. Two are locomotive tender frames, one of which is machined and finished ready for erection, and the other is left just as it was taken out of the hydraulic press. Two bogie trucks are also exhibited. One is applicable to carriages and waggons of all classes, although it has been specially designed to suit the Indian State Railways. The other bogie truck is of an American pattern, of which large numbers have been and are being made of various styles and dimensions. A truck of the type exhibited has been subjected to the test of a dead load of 130,186 lbs. without showing the slightest signs of deformation or deflection, although the working load is only 50,000 lbs.

Amongst a number of models exhibited on the stand, an English coal truck (one-eighth size), constructed, except the flooring, of Fox's patent pressed flange plates, is of interest, as well as those of the patent corrugated flues.

It would appear that as great success is attending the use of Siemens-Martin steel, manipulated by hydraulic pressure by the Leeds Forge Co., in railway stock as for marine engineering, and this is no doubt largely due to the unwearied efforts of Samson Fox, Esq., C.E.

The corrugated tyre carriage wheels exhibited stand is only one out of many evidences of the versatility of purposes in which the corrugated steel is employed. This corrugated tyre upon the specimen exhibited at the Tyne Exhibition, and has had a projections on the edges of the

necessary to mount the rails of tramways, hence the danger of skidding is diminished, and other advantages are claimed.

The office fitted up for the convenience of visitors, surmounted with the signboards, and surrounded by numerous diplomas, &c., including those obtained at the Newcastle-on-Tyne, Inventions, and other exhibitions, is a conspicuous object on our illustration, to which attention does not require to be demanded. It, however, forms part of the agreeable *tout ensemble*, no small feature of which is the abundance of room on the stand, so permitting interested spectators to closely examine each article without inconvenience.

In closing this notice of the Leeds Forge Co.'s exhibits, one remark we can scarcely fail to make, and we believe it will be concurred in by all of our readers who have visited the Paris Exhibition, *i.e.*, that the company has set an example to our manufacturers and engineers at home, which should have been more generally followed, and would have ensured a worthy representation of British skill and industry.

### ROSE'S "INSTANTER" PORTABLE FURNACE.

HEREWITH we give an illustration of a recently invented portable furnace eminently adapted for heating, amongst other things, rivets for all classes of iron and steel structural work, the inventor being Mr. George Rose, of 70, Wellington Street, Glasgow. As will be seen from our illustration, the furnace is of a self-contained character, and so much so is this a feature, the inventor has wisely availed himself of the adaptability of the heating medium for lighting purposes, and has provided a lamp to accompany the furnace, and so render it available in any situation on the darkest of nights. In respect of its self-contained character, the "Instanter" differs from some of the earlier forms of portable furnaces, which required a steam boiler or air compressor. The liquid fuel is stored in a tank above the furnace, and is conveyed thence by a pipe to the burner at the back, attached to which is an arrangement for controlling its flame or regulating the heat of the furnace. This arrangement takes the form of a globe with a small wheel-valve underneath, by the opening of which the heat is instantly reduced or intensified as required. In practice superheated steam or steam gas is used to inject the oil in the form of spray. The water required for this purpose is stored in the tank shown at the back of the furnace, and is forced up to the superheater by a small force pump. The superheater consists of a double coil, which surrounds the flame as it issues from the burner, and is so arranged that the water is made to boil in the first portion of the coil, whence it passes to the second, where it is raised to a temperature of 600° cent., which converts it into superheated steam or steam gas capable of being burned in the flame. Passing to the back of the burner, this steam gas escapes through a nozzle in the form of a powerful jet, and the oil, being conveyed to the burner in such a way as to fall on the top of this steam jet, is dispersed into its furnace in the form of fine spray. To start the furnace, an air blast is con-

veyed from the pump in its water tank, this blast spraying the oil and rendering it ready for ignition; the flame issuing from the burner radiates upon the steam generating and superheating arrangement, raising it to a high temperature in a few minutes. After this, the air is turned off, and the water from the tank turned on, being immediately converted into highly superheated steam or steam gas, which sprays the oil and gives a powerful and intensely hot flame.

This furnace, the maker states, can be worked at a pressure of from 1 to 2½ lbs. per square inch, but if the pressure is pumped up to 15 lbs. it will burn for



12 hours without further pumping. The time necessary to bring up the furnace to a white heat is about half an hour, although the heat necessary for rivets small bogie wheels and like articles can be attained within twenty minutes from the time of starting. The water consumption per hour is two pints, whilst the oil consumption for a like period does not exceed 2½ gallons. The furnace is, of course, smokeless. The lamp fitted to the furnace, and shown on our illustration, is a valuable auxiliary; it can be lit at a moment's notice, and is capable of giving a light of from 3,000 to 4,000 C.P., at a cost of about 1½d. per 1,000 C.P. per hour.

### PARIS EXHIBITION.

MESSRS. SIMPSON, STRICKLAND & Co.'s EXHIBITS.

AS we have previously indicated, Marine Engineering is not well represented at this Exhibition by actual specimens of the latest practice. Photographs are merely shown in some instances, models in a few cases, but only one British firm exhibits full-sized *steam marine* engines in the Palais des Machines, viz., Messrs. Simpson, Strickland & Co., of Dartmouth. Although the exhibits of this firm are specially designed for yachts and launches, and hence are not of great magnitude, yet they are of considerable interest, as being illustrative of the most recent developments in marine engineering, and having special details not found in ordinary practice.

At their stand in the Palais des Machines, Messrs. Simpson, Strickland & Co. exhibit four highly-finished specimens of their marine engines—one of which has a boiler in connection—but besides these, this firm has also afloat in the River Seine, at the Quai d'Orsai, a yacht's steam launch, which in Figs. 1, 2, 3 on page 268 we illustrate—and, as will be seen, each of the four marine engines

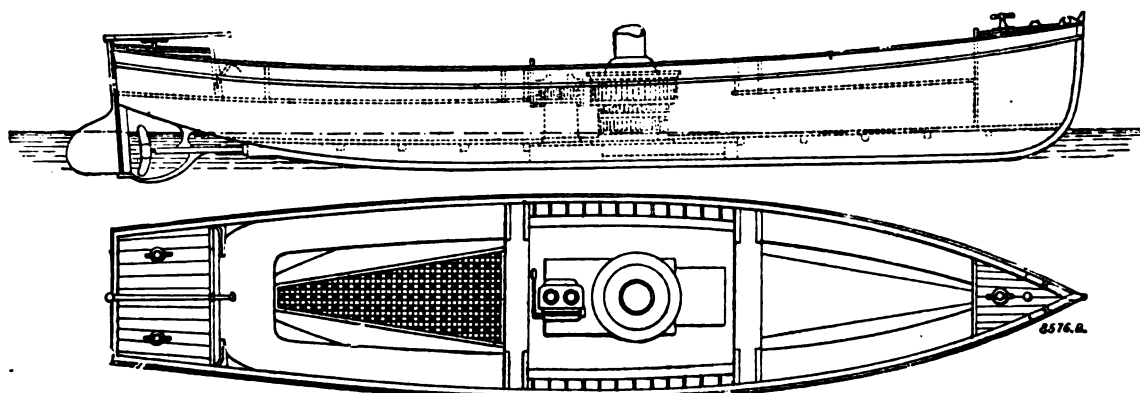
smaller one, a single tandem with  $3\frac{1}{2}$  in. and  $8\frac{1}{2}$  in. cylinders, and  $6\frac{1}{2}$  in. length of stroke, designed to work with steam at 80 lbs. pressure; and the larger one, a twin tandem, having two high-pressure cylinders of 4 in. diameter, and two low-pressure cylinders of 10 in. diameter, constructed to work with steam of 90 lbs. pressure. One valve regulates the admission and emis-



FIG. 1.

exhibited is of different size and for working at pressures varying from 80 lbs., 90 lbs. to 175 lbs. per square inch. It must be allowed that the firm is well represented, and has shown a commendable example to other marine engineers at home and abroad. Examining the exhibits of Messrs. Simpson, Strickland & Co. at their stand in the Palais des Machines, we find two of their "Kingdon" patent compound engines, and two of the same type of quadruple-expansion engines. Owing to many difficulties in the adapting compound surface-condensing machinery

sion of steam to both the high and the low-pressure cylinder, the high-pressure piston-rod having rectangular grooves, to prevent any passage of steam from the high to the low-pressure cylinder on the upstroke. On the downstroke the steam passes from the bottom of the high to the top of the low-pressure cylinder, and leakage past the piston-rod is of no consequence. In no instance has any trouble been found with this form of piston-rod from leakage on the upstroke, and as a gland is dispensed with, by this construction there is reduced



FIGS. 2 &amp; 3.

for practical work on a small scale, the old-fashioned type of high-pressure engine had continued to be almost exclusively used in small craft until about eight or nine years ago, when Messrs. Simpson & Denisons, now Simpson, Strickland & Co., introduced the simple form of tandem compound surface-condensing engine, with a natural draught boiler, now known as the "Kingdon's" patents. The compound engines exhibited are of two sizes, the

friction. The space occupied by foundations of these engines is regulated as to area by the size of the large cylinder, and the height is much less than in the ordinary type of tandem engine. The steam is carried throughout about nine-tenths of the stroke in all cylinders, and consequently the effort on the crank is very uniform. Both the pistons being on the same piston-rod, the strains on the crank shaft, due to an unequal amount of work being

accomplished in two cylinders at different periods of the stroke are entirely obviated, and the engines are exceedingly easy to start or reverse.

There are other features to be noticed in Messrs. Simpson, Strickland & Co.'s engines, but as both those already enumerated, and those yet to be mentioned are common alike to the compound and quadruple-expansion engines, we pass on to notice those of the latter type that are exhibited. In Fig. 4, we illustrate the larger one, capable of exerting about 40 H.P., with

engine builders' patent, and are driven direct from the cross head of the engine, without the intervention of levers or weigh shafts, and are attached immediately at the back of the web framing. These pumps are constructed entirely of gun-metal and are fitted with metal valves, being especially designed to work at as high a speed as 400 to 500 revolutions per minute, at which they will maintain a steady vacuum of from 25 to 27 inches, and in no instance have they failed or given trouble. They are fixed, as will be seen in Fig. 8, in the framing

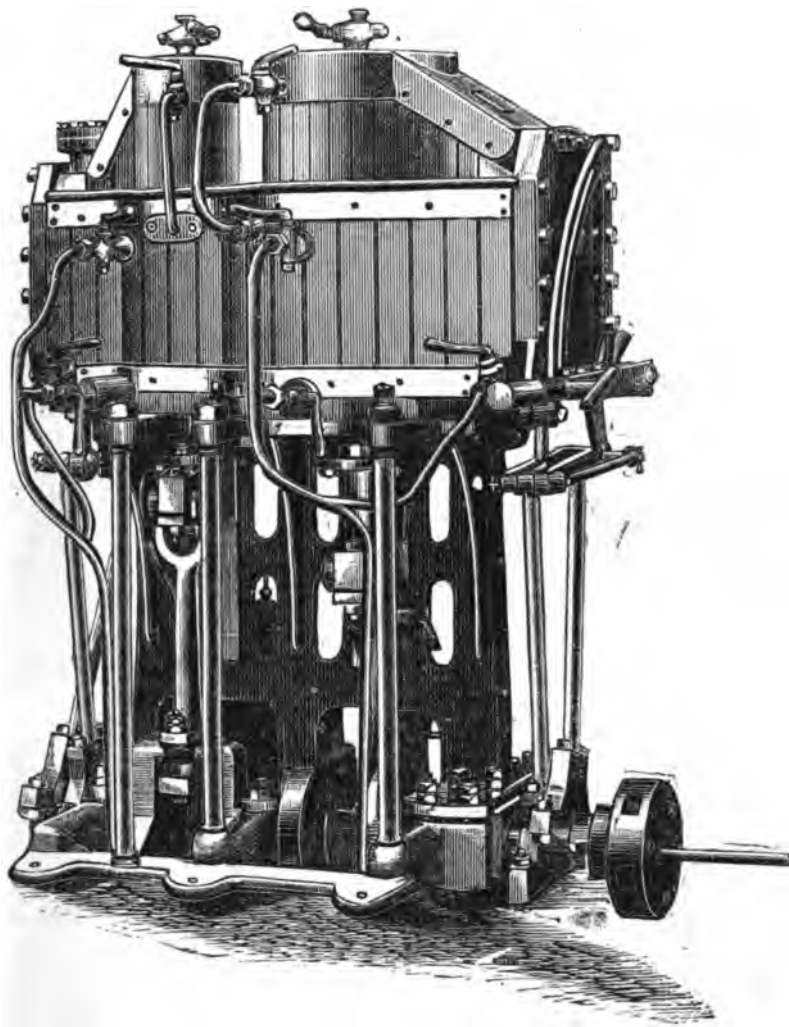


FIG. 4.

steam of 175 lbs. It has a  $3\frac{1}{2}$  in. diameter high-pressure cylinder, a  $5\frac{1}{4}$  in. diameter intermediate high, an 8 in. diameter intermediate low, and a 12 in. diameter low, pressure cylinder, all having a stroke of  $6\frac{1}{2}$  in. As will be seen from our illustration, the engine cylinders, which are lagged with teak, are supported on wrought iron front columns, and a casting at the back, upon which the guides are formed. The engine is fitted with coupling and link motion; and all the working parts are of steel. Efficient lubricators to the cylinders, and drain cocks, with unions and copper pipes to the cylinders and steam chest are fitted. The feed and air-pumps are the

of the engine, so that there are no pipes projecting in the boat. The bottom valve of the feed pump is formed with a long spindle, making a working fit in a hole bored in the pump plunger. The spindle becoming coated with grease from the condensed water, causes sufficient friction to lift the valve at the commencement of the upstroke of the plunger, and keeps it open during the stroke, thus leaving a free passage for the water, and closes it at the commencement of the down stroke, compelling the water in the pump barrel to close through the top valve. The bottom valve of the air-pump is made in the piston, which is allowed a small amount of vertical motion on the

piston-rod, and is so arranged that, on the down stroke the friction of the packing against the bore of the pump raises it, thereby leaving a free passage through the valve, and on the up-stroke presses it down, and so closing the passage, and compelling the contents of the pump barrel to pass through the top valve, which is constructed of metal. Our illustration does not show the condenser, which is fitted on the starboard side of the engine, but distinct from it. The tubes are of solid drawn copper, and gun-metal connections are fitted for passing through the shell of the vessel. The exhaust steam enters the fore end of the condenser, the air-pump taking off the condensed steam at the after end. The hot well is of brass, connected to the feed and air-pumps by copper pipes.

The engine illustrated on Fig. 4 is adapted for a yacht 50 ft. long and 7 ft. beam, and on Figs. 5, 6, and 7 (pp.

made that the diameter is practically equal to the height, and therefore has its centre of gravity nearly as low as a horizontal one, and has from its formation a very large steam space and water surface, so obviating all priming tendency. The tubes, being proportionately smaller as the depth of water through which they pass is less, cause the products of combustion to pass off at a very low temperature, and so effects considerable economy. The large size of the fire-grate— $6\frac{1}{2}$  square feet of surface—enables steam to be raised quickly, and a full head to be carried with a very moderate natural draught. The boiler has thus minimum wear and tear, and the objectionable emissions from the funnel, &c., usual with forced draught, are avoided. The total heating surface is 116 square feet. All the working parts of the boiler, except the tubes, are constructed of the best quality of Siemens-Martin steel.

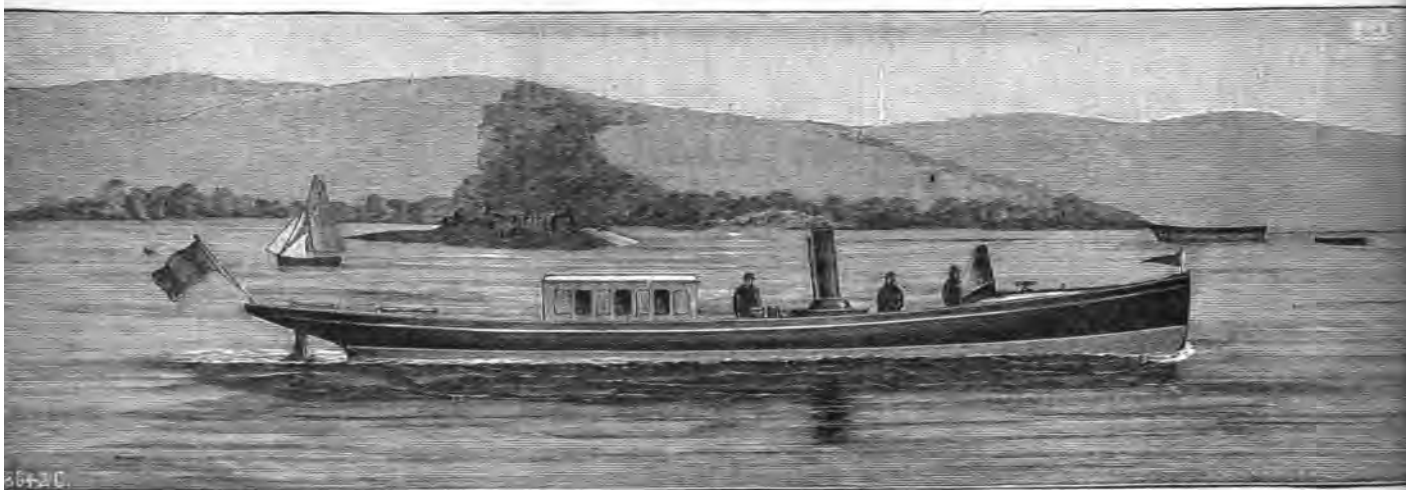


Fig. 5.

270, 271), we show a vessel of this size several of which have been constructed by Messrs. Simpson, Strickland & Co., who, besides other craft in progress, are building eleven steam launches for Buenos Ayres. Fig. 5 shows an external view, Fig. 6 a longitudinal section, and Fig. 7 the deck and machinery plan. These vessels can be built of wood, iron, steel, or Delta metal, and it will be seen all the after dead-wood is cut away, so minimizing weight, sufficient immersion of the propeller, and a large area of rudder are obtained without carrying the rudder-post—by which the after bearing of the propeller shaft is partially supported—below the line of the keel. Vessels of this size, fitted with the engines shown on Fig. 4, are frequently worked under the sole charge of one man, and will maintain a speed of about 13 miles an hour, on a consumption of 25 lbs. of coal per hour. When constructed for sea work these craft have given great satisfaction, proving good sea boats. The screen forward of the steering wheel shown on Figs. 5 and 6, is to protect the steersman, the steering wheel being placed well forward. The screen is removable in fine weather, or for river navigation. The engine and boiler are placed slightly forward of amidships, so admitting of a roomy deck cabin abaft, and other passenger accommodation. The boiler is

—it has the tubes entirely immersed. It is so

The smaller quadruple-expansion engine exhibited is capable of exerting 17 H.P. to 18 H.P., and has one of the Kingdon patent boilers in connection, as shown in our illustration (Fig. 8). Visitors have thus an opportunity of making themselves *au fait* in the departures from ordinary practice, which distinguish Messrs. Simpson, Strickland, & Co.'s specialities. The cylinders of the engine, shown in Fig. 8, are respectively  $1\frac{1}{2}$  in.,  $2\frac{1}{2}$  in., 4 in. and 6 in. diameter, and have each  $3\frac{1}{2}$  in. stroke. It is in every respect similar in construction to the larger one, already described and illustrated in Fig. 4, but Fig. 8 shows the back view of the engines, the position of the air and feed-pumps, lubricating arrangements, and other details, are also clearly seen. In the engine of this size, shown at the Paris Exhibition, a three-bladed propeller is attached on a length of shafting coupled to the crank shaft, to render the exhibit more complete. The propeller is 1 ft. 8 in. diameter and 2 ft. 8 in. pitch. The boiler is one of Kingdon's vertical natural draught type, constructed of Siemens Martin steel for a working pressure of 175 lb. per square inch, and of similar design, although smaller in size, to that fitted in the steam-yacht (Figs. 5, 6, and 7). The grate surface is 1.76 ft., and the total heating surface 27 ft., the tubes, which are of brass, being placed vertically. Owing to the large

size of the fire-grate, steam is raised rapidly, and this feature also renders the boiler very efficient when using wood as fuel. The dome and funnel are also of brass, and the greater part of the boiler is lagged with teak. Owing to its construction, it is easy of access for repairs, and it is fitted with a water ash-pan, which prevents dust and dirt, and enables the fire bars to last many months. The

As will be seen from our illustration, in addition to the steam-feed pump, a gun-metal pump actuated by a hand-lever, is provided at the starboard side of the boiler, so that the boiler can be pumped up when there is no steam, &c. Between the engine and boiler may also be discerned a small fan blast, which is provided where a maximum power is wanted with a minimum weight.

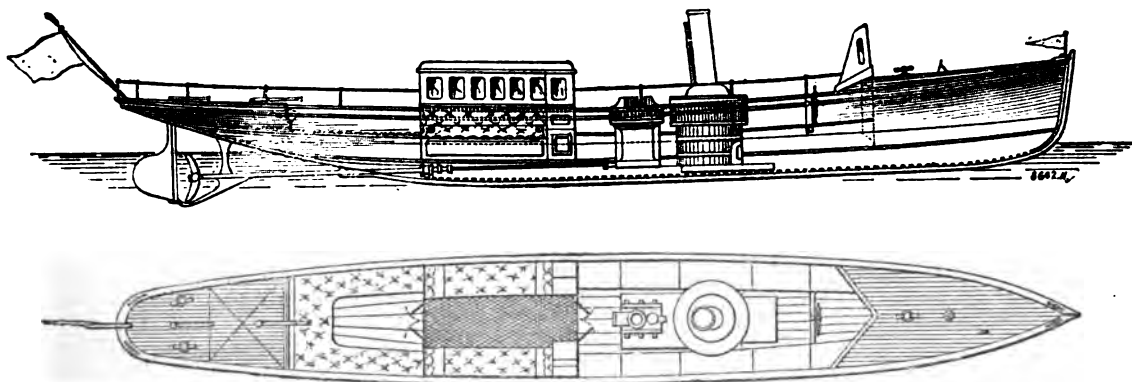


FIG. 6 &amp; 7.

quantity of water in it is small for the power developed, but from its shape a considerable alteration in the amount of water in the boiler can take place without naturally affecting the water level. We are informed it is impossible for the boiler to get short of water without attracting attention, owing to the pump being self-acting, and no case of a cracked tube plate has ever been known to occur.

Attention has already been directed to the steam launch, exhibited afloat in the River Seine, illustrated in Figs. 1, 2, and 3, and a short description must suffice, as the engines and boiler with which it is fitted is identical in nearly every respect with that just described and illustrated in Fig. 8. The launch is 27 ft. in length, 5 ft. 8 in. beam, 2 ft. 8 in. in depth. It is carvel, built of

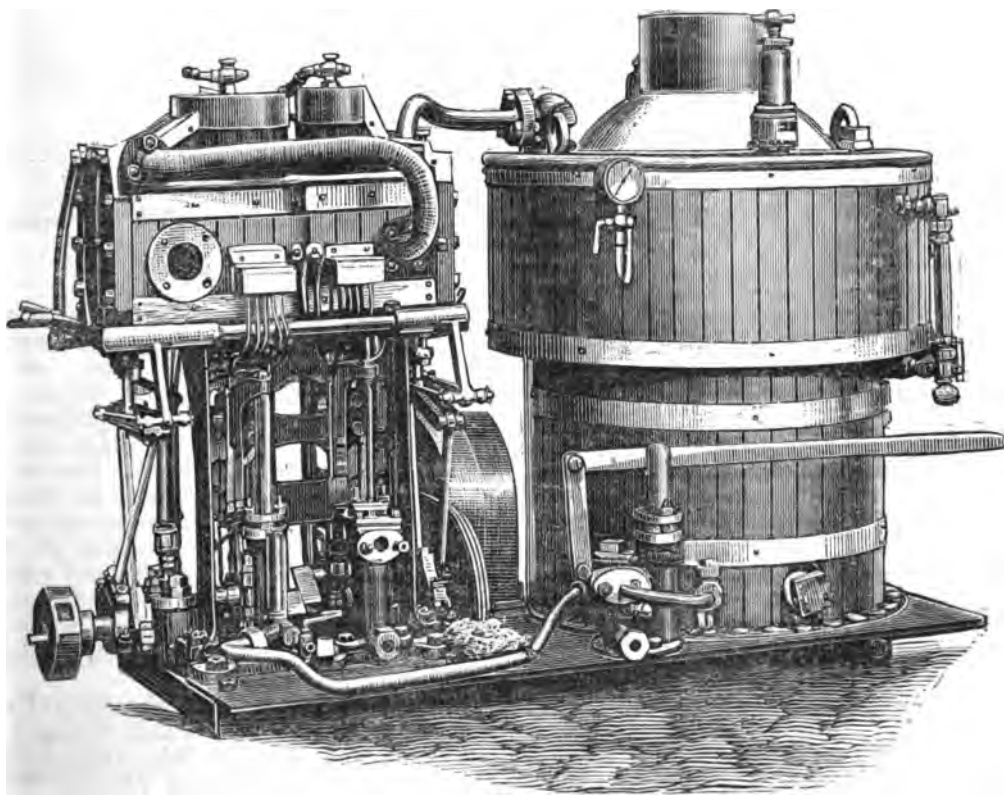


FIG. 8

mahogany, and attains a speed of about ten miles an hour. The boiler is 2 ft. 6 in. and 2 ft. 1 in. high, and the total weight of machinery and boiler is under half a ton.

It may be mentioned that the steam launch races at Dartmouth Regattas, 1887 and 1888, were won by launches fitted with Kingdon engines and boilers. In this small vessel the condenser consists of a solid drawn copper pipe of D section, placed outside the boat along the keel, the ends being fastened into metal castings passing through the skin. This pipe, which forms a very efficient surface condenser, is connected at the forward end with the exhaust, and at the after end with the air-pump suction.

In closing our notice of Messrs. Simpson, Strickland & Co.'s exhibits, it only remains to be said that the piston rods, slide valves, air pumps, and general arrangements of both engines and boilers form the subject of existent patents, which are the property of Messrs. S., S. & Co., who are the sole manufacturers; and that on the closest examination we found the engines, boilers, &c., to be first-class specimens of good workmanship and material, and such as would do credit to any marine engineering establishment.

### PARIS EXHIBITION.

#### MESSRS. FLEMING & FERGUSON'S PATENT QUADRUPLE-EXPANSION ENGINES.

**A**LTHOUGH, owing to various causes, it was scarcely practicable for British marine engineers and shipbuilders to have large exhibits sent over to the Paris Exhibition, yet several firms have not therefore stood aloof altogether, but have endeavoured to be fairly well represented by means of models, photographs, &c. Prominent amongst the number is the firm of Messrs. Fleming & Ferguson, Shipbuilders and Engineers, Paisley, for although they have only two models and a number of photographs on their stand, yet as some of the latter are representative of the latest development of marine engineering, and the engines represented have important deviations from ordinary practice, they are of supreme interest.

Reserving a detailed account of their models and photographs of dredging plant, steam yachts, &c., which will in due course be noticed in our articles on Naval Architecture at the Paris Exhibition, we would draw our readers' attention to the marine engines shown in our double-page plate illustration, which were recently fitted in the steamship *Singapore*, a vessel which has been built by Messrs. Fleming & Ferguson for trading from Singapore to the islands adjacent, carrying 1,500 tons deadweight on 13 ft. draft of water.

Illustrations showing the general arrangements of the engine and boilers, shafting, piping plan, &c. (Figs. 1, 2, and 3), will also be found on pages 272, 273, and the longitudinal section (Figs. 4 and 5), on page 274, besides cross-sections through the engine-room (Fig. 6), on page 275, and through the boiler space (Fig. 7), on page 276.

At a glance it will be seen that these engines represent a new departure in marine engineering. Unlike the ordinary quadruple-expansion engines, they are

not tandem, but have all the four cylinders on the same plane, the cylinders being 24 in., 30 in., 40 in., and 60 in. respectively in diameter, with two piston valves in the centre of the group, making a very compact and accessible arrangement. Two of the cylinders are placed on the port side of the crank shaft and two on the starboard side, all standing vertically, and supported by two cast-iron columns on the condenser and two turned malleable iron columns in front. Between the cylinders are the valve casings, in which the piston valves work, there being one valve for Nos. 1 and 2 cylinders and one valve for Nos. 3 and 4. The covers of the cylinders and valve casings are all independent and immediately accessible for opening out for examination or overhaul, there being nothing to move before getting at any of the covers.

The valve motion is simple, two eccentrics only being required for either ahead or astern gear for all four cylinders.

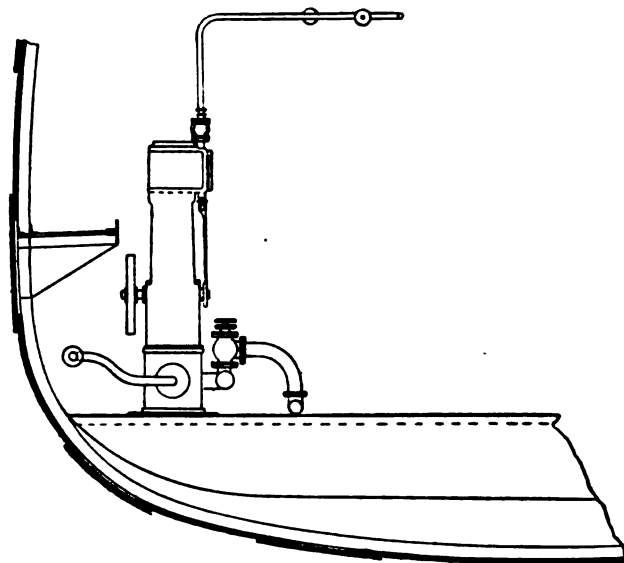


FIG. 3.

Fig. 8, on page 276, shows the arrangement. It consists of two sets of ordinary link motion worked by one go-ahead eccentric, and one go-astern eccentric. The valve spindle, which carries the piston-valves for Nos. 3 and 4 cylinders, is worked direct by the quadrant-rods, which are jointed to the eccentric straps as shown. The valve spindle, which carries the piston-valves for Nos. 1 and 2 cylinders, is worked by the eccentric rods fixed to the eccentric straps, the direction of the motion being changed by bell cranks, and transmitted to the quadrant through the quadrant-rods. The reversing of the engines is effected by means of the steam-starting engine, or by hand, as shown in the diagram.

The connecting rod is a steel casting of a triangular pattern, each angle of the base taking a piston-rod, the stroke of the cylinders being 42 in., while, owing to the angle of the connecting rod, the stroke of the cranks is 36 in. The apex of the triangular con-

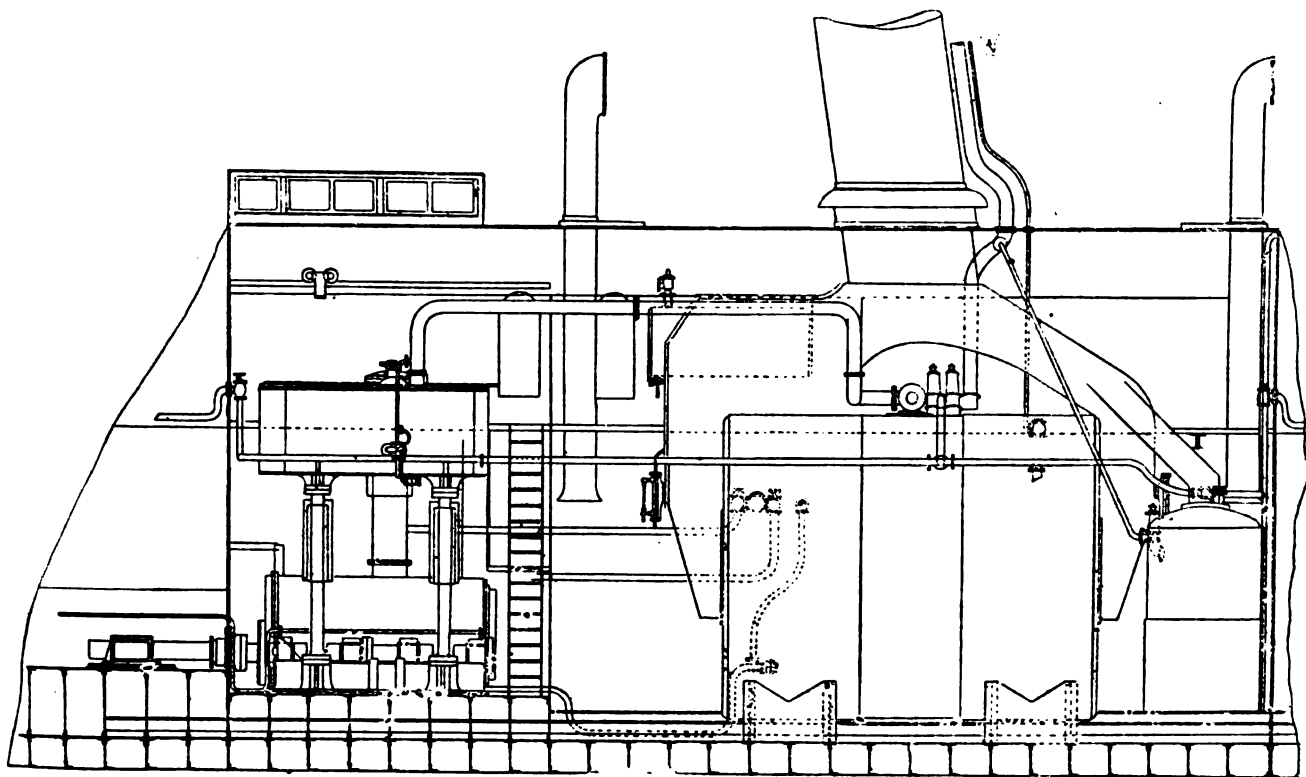


FIG. 1.

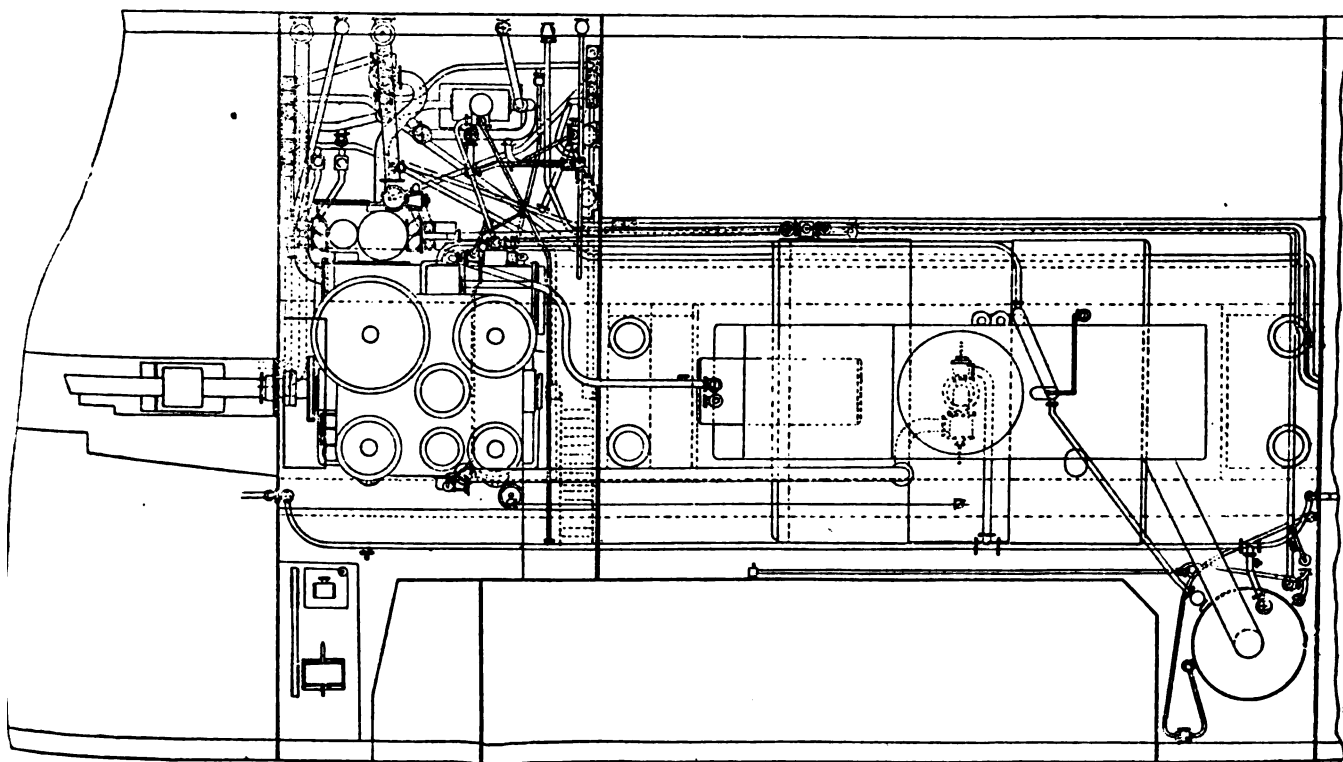


FIG. 2.

necting rod is attached to the crank, and the base at its centre is connected to a lever working off the

shaft, and these are directly opposite to each other, making the balance of working parts at least equal

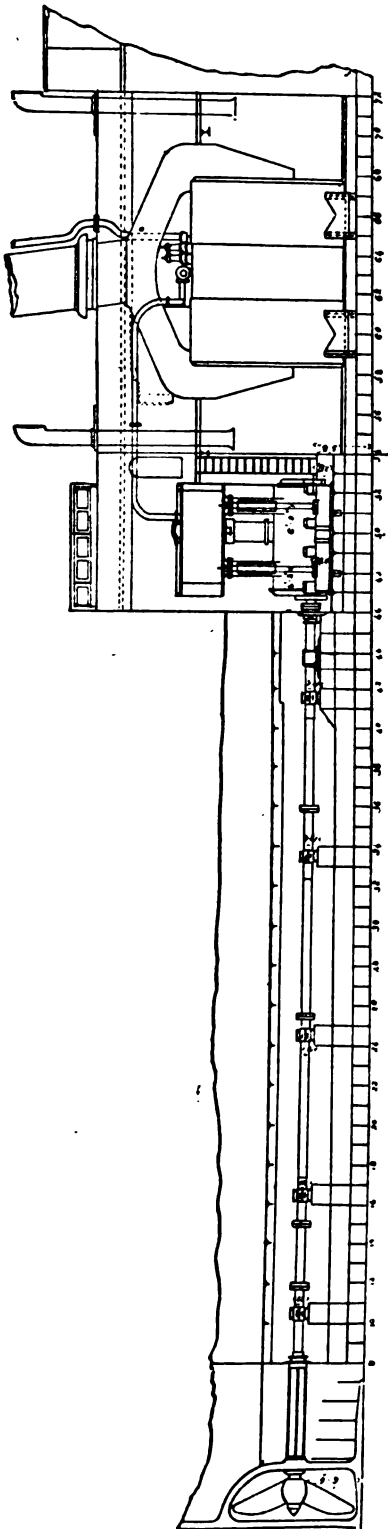


FIG 4.

back column, the lever actuating the main feed, air, circulating and bilge pumps.

It will be seen there are two cranks on the crank-

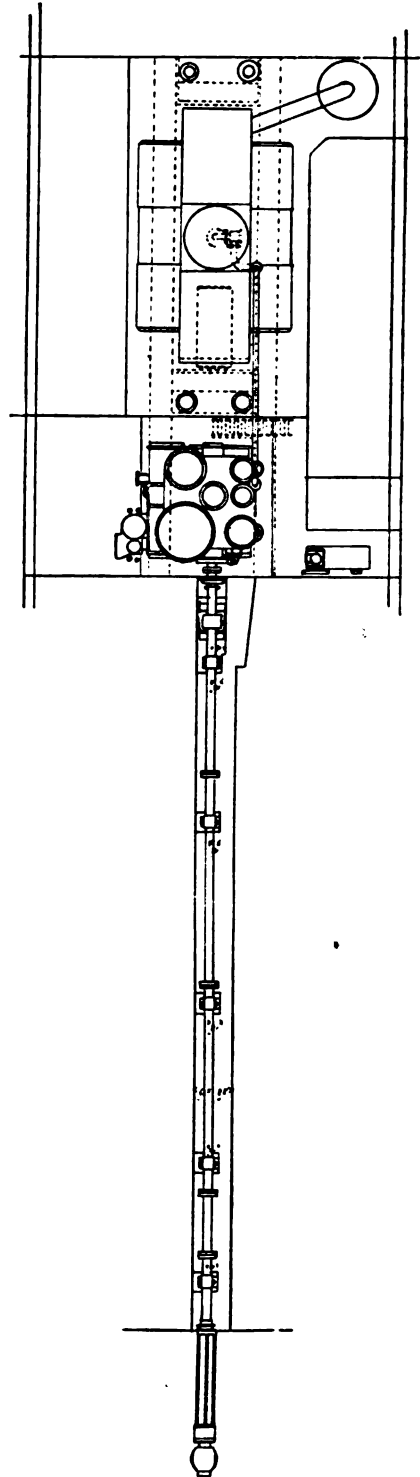


FIG. 5.

to that of a three-crank engine, while the action of this engine in its working parts is equal to four cylinders placed in line on four cranks at right angles

to each other. This arrangement ensures the engine being perfectly under control, there being no position of the cranks from which they will not readily start.

The steam-starting engine is fixed on the back of the condenser, and a hand-wheel is fitted on the outer end of the starting engine crank shaft, for the convenience of the engineer on the starting platform.

The base of the engines is under 10 ft. square, and the total length of the engine-room is about 14 ft., which must be allowed to be a small space for engines indicating over 1,600 H.P. Steam is supplied by a double-ended boiler 14 ft. 6 in. diameter, 18 ft. long, having six furnaces and working at a pressure of 165 lbs.

It is fitted with a hydrokeneter, surface, and main blow-off cocks, feed, safety-valves, and all usual fittings. In a recess on the starboard side of the forward stokehole is the auxiliary or donkey-boiler for

Register of British and Foreign Shipping, the consumption was found to be only 1.121 lbs. per I.H.P. per hour, and this result is borne out by the actual experience of another steamer fitted with Messrs. Fleming & Ferguson's patent quadruple-expansion engines on a voyage out to Buenos Ayres, when on the passage outwards the consumption was found to be 112 lbs. per 100 I.H.P. per hour, which is undoubtedly a remarkably favourable result.

Incidentally, some of the advantages of this type of quadruple-expansion engine have been indicated, but the more closely the engines are considered, the more numerous and important do the benefits appear to be.

Amongst the most important are:

(1.) There is a greater range of expansion with less condensation in the cylinders, the fall of the tem-

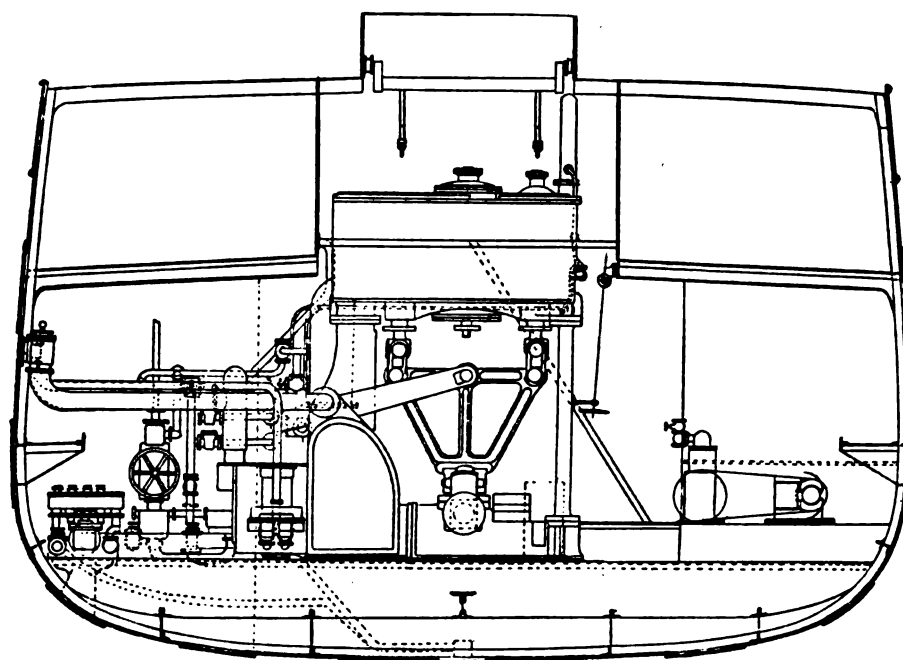


Fig. 6.

supplying steam to the steering-gear, winches, &c. A recess on the starboard side of the after-end of the engine-room is allocated to the electric lighting plant, oil tanks, and engineer's store-room; and on the port side are the usual sea connections, bilge-suction boxes, donkey bilge, ballast, and feed-pumps, as shown in our illustrations.

Besides the donkey-pumps referred to, there are the following pumps worked off the main after-engine:—the air-pump, 21 in. diameter, 18 in. stroke; the circulating-pump, 11½ in. diameter, double acting, 18 in. stroke; two feed-pumps, 3½ in. diameter, and two bilge-pumps, 3½ in. diameter, all 18 in. stroke; and by the levers off the forward engine, the sanitary and other pumps.

The consumption of fuel has been found to be very economical in these engines. On a steam trial, conducted under the supervision of Mr. James Mollison, the Chief Engineer-Surveyor at Glasgow for Lloyd's

perature in each cylinder being very much less than in a triple-expansion engine for the same range of expansion; and it is apparently also fairly claimed that whatever the working-pressure of steam may be, this patent quadruple-expansion engine gives better results at that pressure than it is possible to obtain from a triple-expansion engine.

(2.) There are fewer vital parts than in a triple-expansion engine. There are only four main bearings, but of ample length and area, as compared with six in the ordinary triple-expansion engine; two as against three crank pins, and two eccentrics for valves as against six eccentrics in the usual design of triple-expansion engines. Evidently in this respect there is a saving in wear and tear, lubrication, &c.

(3.) A considerable saving of space in the vessel is obtained, and at the same time a more accessible engine. The length of the engine is a cylinder less

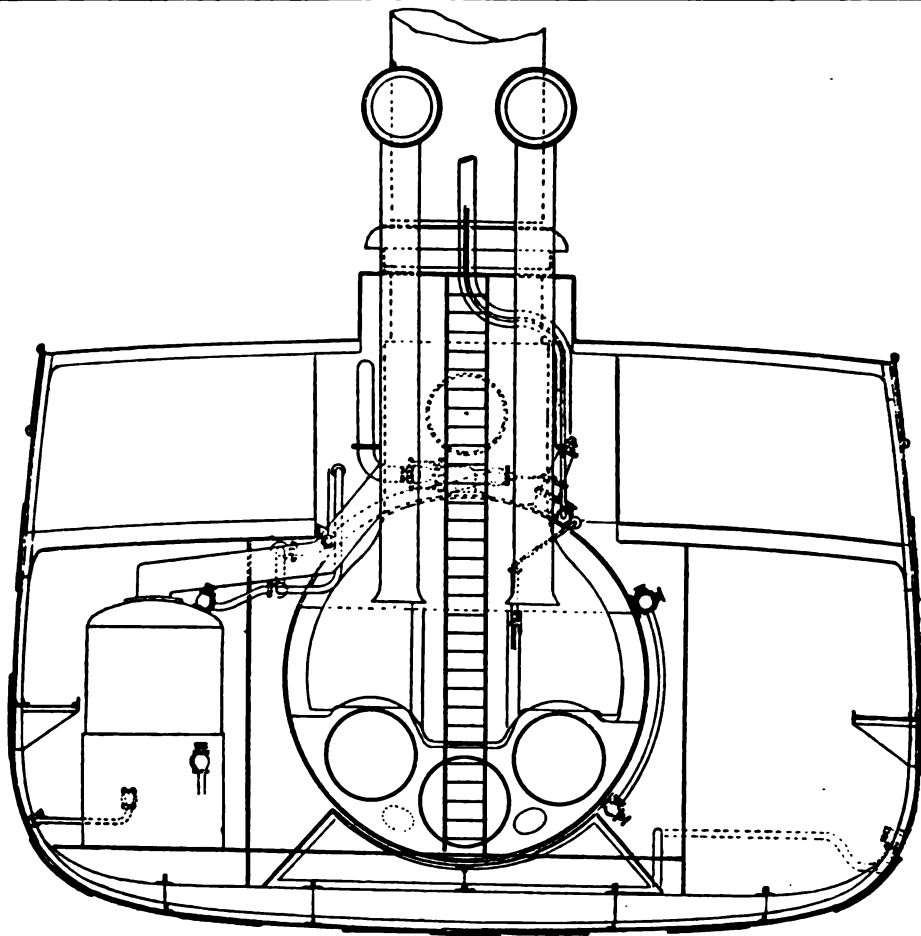


FIG. 7.

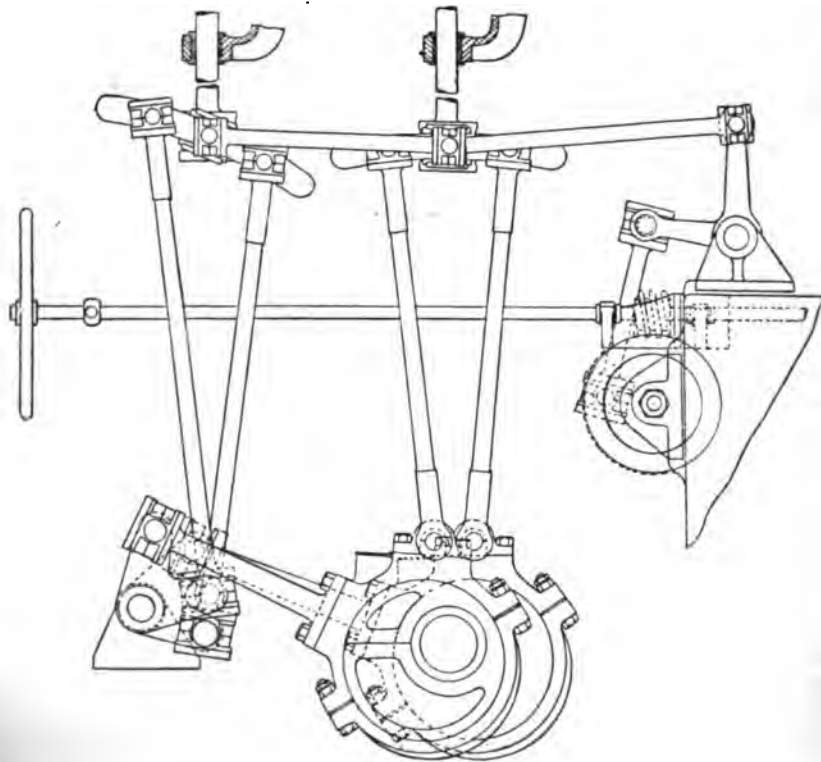


FIG. 8.

than in triple-expansion, three crank engines, whatever valve gear be designed and fitted to the latter. As to readiness of access; there are no side doors to be taken off to get at the slide valves, these being easily accessible from the top of the engines; while the two valve casings, being between the cylinders and fitting conveniently into spare spaces, ensures economy of space.

(4.) There is considerably less vibration than in ordinary engines. This is testified to by the owners of several steam yachts fitted with Messrs. Fleming & Ferguson's quadruple-expansion engines, who have stated that "unless they are in the engine-room they can scarcely realise they are not on board a sailing yacht." This is obviously due to the weights being kept low, and to the breadth of the base of the engines, as well as to the better division of power in revolving the crank-shaft, the arrangement being equal to four right-angle cranks in line driving the shaft, as against three cranks in the ordinary triple-expansion engine.

(5.) There is a great decrease in the loss by radiation owing to the arrangement of the cylinders. The steam port passages are also very short, and the heat radiated from the casings, &c., is confined by and given out again to the cylinders.

(6.) Attention has been previously directed to the readiness which, with the engine at any position, it can be started, stopped, or reversed; but it is also important to notice that in the event of an accident to either of the forward pair of cylinders, or to the forward crank, necessitating the disconnection of that engine, the after-engine can be driven as an ordinary compound-engine, the action of the after-pistons on the crank being exactly equal to that of a compound engine with the cranks at right angles, *minus* the difficulty there would be in starting tandem-placed cylinders, or a single cylinder on one crank.

Amongst the other vessels that Messrs. Fleming & Ferguson have fitted with their patent quadruple-expansion engines are the steel screw steamer *Skeandhu*, a yacht built by them for Scholto D. C. Douglas, Esq., of Coatbridge Castle, near Glasgow, a vessel which has attained a speed of  $10\frac{1}{2}$  knots per hour, with 130 I.H.P.; and the screw steam yacht *Grace Darling*, built for J. Carburry Evans, Esq., of Hatly Park, Cambridgeshire, fitted with patent quadruple-expansion engines, indicating 350 H.P., and steaming  $12\frac{1}{2}$  knots per hour. In four screw steamers employed by Mr. T. A. Walker in his harbour works at Buenos Ayres, Messrs. Fleming & Ferguson have also fitted their patent marine engines, and at present they have several sets on hand for other steam vessels.

Not only do these patent quadruple-expansion engines appear to have many advantages as marine engines on screw steamers; but their design would also be readily adapted to paddle steam vessels while for electric lighting purposes, where an absence of vibration is so important, they also appear to be very suitable.

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**FAST STEAMING TO THE CAPE.**—The Union Steamship Co.'s Royal Mail steamer *Moor*, which left Southampton on September 6th, arrived at Cape Town at 9 a.m. September 25th. Stoppages at Lisbon and Madeira deducted, her net steaming was 17 days 23 hours 45 minutes, and this it is claimed, is the fastest passage yet made between Southampton and Cape Town.

## PARIS EXHIBITION.

THE UNITED ASBESTOS COMPANY'S, LIMITED, EXHIBITS.

IN the North Gallery of the Palais des Machines, next to the stand of Messrs. Donald, Currie, & Co., is that of the United Asbestos Co., Limited, of 161, Queen Victoria Street, London, E.C.; 34, Deansgate, Manchester; Quayside, Newcastle-on-Tyne; 47 & 49, South John Street, Liverpool; Mount Stuart Square, Cardiff; 60, West Howard Street, Glasgow; and 16, Rue Curial, Paris.

This company was formed in the year 1880 by an amalgamation of the three following concerns—(a) the Patent Asbestos Manufacture Co., Limited, of Glasgow, (b) the Italo-English Pure Asbestos Co., Limited, of London, and (c) the Asbestos mines and business of Messrs. Furse Bros. & Co., of Rome, and it is interesting to note that the first-mentioned of the trio was formed in 1871 and was the pioneer company in the European Asbestos trade.

It must be acknowledged that the exhibits of the United Asbestos Co. are of a complete character, embracing, as they do, many specimens of the raw and manufactured material, but, in addition to the various exhibits on their stand, their materials are to be met with throughout the whole machinery department of the exhibition. The whole of the steam boilers and pipes in the electric lighting department have been covered with the United Asbestos Co.'s Asbestos Non-conducting Composition, claimed to be the lightest, most durable and economical in the market. The whole of the steam joints of the engines and steam pipes have been made with the company's "Victor" metallic rings and their special A 1 quality of Italian Asbestos Millboard. The latter—not the many cheap and worthless imitations of this material—is admitted to make a most durable and economical packing for dry steam joints. As compared with india-rubber it is cheaper in first cost by reason of its lightness, lasts very much longer, and with a little care, may be used on repeated occasions. It is guaranteed to contain at least 93 per cent of pure Italian Asbestos.

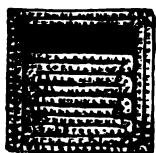
The "Victor" metallic rings are a speciality introduced about three years ago to meet the requirements of the high pressures of steam employed in triple and quadruple-expansion engines, and has the feature common to the asbestos-metallic goods of the company, that every asbestos thread has a core of fine wire—a uniform surface of asbestos thus being presented to the wear. Nearly all the man-hole and mud-hole joints in H.M.'s vessels have been fitted with these United Asbestos "Victor" metallic joints, with entire satisfaction, and we are informed on the best authority that not a single failure has occurred.

Amongst the many specimens of goods exhibited at the company's stand we noticed their United Asbestos rubber-woven rings and man-hole joints, composed of asbestos and wire, similarly to the "Victor" metallic rings, but instead of being cut out of a sheet, the rings are woven to the required shape. They are thus more readily bent into position without puckering, and are well worthy the notice of marine engineers.

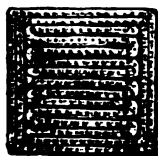
The space at our command precludes a detailed reference to the company's rubber-woven tape, expan-

sion tape, composition sheeting, asbestos millboard, and to the great variety of engine packings they manufacture—but *en passant* it may be stated that the glands of the engines in motion at the Paris Exhibition have been packed with the United Asbestos Company's Italian asbestos packing.

We illustrate four different specimens of the United Asbestos "Victor" metallic packings, which embody their latest improvements.



Reference has already been made to the special feature of the asbestos metallic goods, viz., that, instead of having an asbestos warp and wire weft, every asbestos thread has a core of fine wire of the best description. The packing above illustrated is so formed, and has



thus greatly increased strength and durability, and as it presents a uniform surface of asbestos to the moving parts it is suitable for wet or dry steam.

It will be noticed two of the illustrations have single cores of india-rubber, an arrangement found to be preferable to three or more cores placed together in triangular or other form.

As already indicated it is impossible in our limited space to do justice to the exhibits of the United Asbestos Co., Limited, and we will close with a brief reference to their "Salamander" lubricants and "Salamander" boiler preservative.

The advantages claimed for the "Salamander" lubricants include freedom from acid, actual or latent; the absence of residue or sediment; the working parts are kept cool and friction reduced to a minimum; there is safety and economy in their use, owing to the high flashing point and the great viscosity, their unappreciable action on india-rubber and asbestos packing, and their adaptability to use in various climates and kinds of machinery, together with entire absence of "gumming" under any circumstances.

The "Salamander" boiler preservative is in two forms, viz., solid and liquid, and has only been introduced after careful testing over a long period of time. It is claimed to thoroughly remove old scale and prevent new incrustation, and is guaranteed to be entirely free from all chemical properties capable of acting injuriously upon iron or other metals.

Altogether our visit to the stand of the United Asbestos Co., Limited, proved of much greater interest than we anticipated, and our notice gives but a slight idea of the number and variety of their exhibits, for we have severely restricted ourselves to what we thought would be of special interest to our readers.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from August 26th to September 25th, 1889:—

Barrett, John, chief engineer to the *Nile*, to date September 17th.  
 Bingham, James, engineer to the *Orontes*, to date September 3rd.

Barry, Geo. W., engineer to the *Sandfly*, to date September 21st.  
 Barry, Jas. H. D., assistant engineer to the *Asia*, for the *Wizard*.

Beckett, W. H., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.

Blundell, Stephen H., chief engineer to the *Blonde*, to date September 21st.

Bolton, Arthur W., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.

Bone, Howard, probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.

Brown, W. J., engineer to the *Tourmaline*, to date October 6th.

Bryan, Richard, probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.

Burner, Alfred, probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.

Carnt, Albert J., assistant engineer to the *Beagle*, to date September 3rd.

Cook, Geo. H., chief engineer to the *Excellent*, additional, to date September 28th.

Coomber, T. G., chief engineer to the *Excellent*, additional, to date September 28th.

Cornish, Edwin, engineer to the *Bellerophon*, additional, to date September 21st.

Crowle, Jos. N., assistant engineer to the *Iron Duke*, to date September 17th.

Cudlip, Edwin W., engineer to the *Terror*, additional, to date September 21st.

Denison, Edwd. L. H., engineer to the *Calypso*, to date September 3rd.

Dixon, Robt. P., acting assistant engineer to the *President*.

Emdin, Arthur R., assistant engineer to the *President*.

Feak, Wm. M., staff engineer to the *Calypso*, to date September 20th.

Flood, Fredk. J., engineer to the *Maggie*, to date September 24th.

Foreman, Felix, staff engineer to the *Devastation*.

Fryer, Geo. H., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.

Goldsmith, H. C., staff engineer to the *Victoria and Albert*, to date September 25th.

Gulliver, Wm. H., staff engineer to the *Forth*, to date October 6th.

Guyatt, Edward G., engineer to the *Malabar*, to date August 31st.

Hawkins, Frank W., engineer to the *Crocodile*, complement incomplete.

Head, E. A. W., engineer to the *Barrosa*, to date September 21st.

Hill, Chas. H., assistant engineer to the *Malabar*, to date August 31st.

Hosken, Wm. E., assistant engineer to the *Indus*, additional, to date September 17th.

Huddy, Tom R., probationary assistant engineer to the *Tamar*, to date September 3rd.

Hutchings, F. H., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.

Jarvis, Fredk., engineer to the *Euphrates*, to date September 3rd.

Jordan, Chas. F., probationary assistant engineer to the *Bellerophon*, additional, to date September 21st.

Jose, F. W. R., probationary assistant engineer to the *Tamar*, to date September 3rd.

Kent, Walter J., assistant engineer to the *Hotspur*, to date October 6th.

Lane, James, engineer to the *Chasseur*, to date September 3rd.

Lawson, Wm. W., engineer to the *Himalaya*, to date September 20th.

Lecky, Chas. B., assistant engineer to the *Canada*, to date October 6th.

Legate, James, fleet engineer to the *Ajax*, to date September 6th.

Little, Herbert J., probationary assistant engineer to the *Bellerophon*, additional, to date from September 21st.

Liversedge, John T., assistant engineer to the *Euphrates*.

Main, Reuben, probationary assistant engineer to the *Scrapia*, to date September 3rd.

Monk, Jos., staff engineer to the *Canada*, to date October 6th.

Moon, H. J. G. G., chief engineer to the *Excellent*, additional, to date September 28th.

Murdock, John, fleet engineer to the *Invincible*, to date September 23rd.  
 Murray, John A., engineer to the *Sparrow*, to date September 3rd.  
 Nicholson, Jas. D., chief engineer to the *Warrior*, to date September 21st.  
 O'Neill, John, acting assistant engineer to the *Anson*, to date August 31st.  
 O'Neill, John, assistant engineer to the *Serapis*, to date October 6th.  
 Paris, Victor de, probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.  
 Parsons, Wm. R., assistant engineer to the *Indus*, for the *Whiting*.  
 Pattison, Robt., staff engineer to the *Valorous*, to date September 6th.  
 Peacock, David, engineer to the *Ajax*, to date October 6th.  
 Peel, Henry C. W., assistant engineer to the *Rupert*, to date September 21st.  
 Rider, Sydney, probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.  
 Roger, C. R., engineer to the *Malabar*, to date September 2nd.  
 Rooms, Geo. W., assistant engineer to the *President*.  
 Rule, Thos., chief engineer to the *Pelorus*, to date September 21st.  
 Rush, Henry C., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.  
 Russell, Chas. B. S., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.  
 Shean, Fredk. E., fleet engineer to the *Rodney*, to date September 9th.  
 Smith, F. P., engineer to the *Vernon*, for torpedo store.  
 Smith, W. A. P., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.  
 Stevens, John G., engineer to the *Vulcan*, to date August 31st.  
 Swinney, Edward, assistant engineer to the *Triumph*, to date September 17th.  
 Taylor, Harry, engineer to the *Pylades*, to date October 6th.  
 Thompson, Geo. F., probationary assistant engineer to the *President*, lent for study at the Royal Naval College, to join on September 30th.  
 Thomsett, Frank D., engineer to the *Serapis*, to date September 3rd.  
 Thumwood, Lewis E., engineer to the *Superb*, to date September 21st.  
 Thornhill, E. C., assistant engineer to the *Canada*, to date October 6th.  
 Tregenna, Harry E., acting assistant engineer to the *Crocodile*, to date September 3rd.  
 Walker, H. J., engineer to the *Beagle*, to date September 24th.  
 Walker, James J., chief engineer to the *Penguin*, to date August 31st.  
 Waterfield, Frank, assistant engineer to the *Northumberland*, to date September 24th.  
 White, W. H., staff engineer to the *Crocodile*, to date September 6th.

## HOAR & BROWN'S HARDWOOD MARKET REPORT, September 23rd, 1889.

**TEAK.**—The stock of timber on the 31st August was 4,706 loads. The deliveries have been somewhat dull during the past four weeks, amounting only to 500 loads, but this quantity will be considerably increased by the end of the month, as the timber is now being delivered without hindrance. The late strike has retarded business very much.

Enquiries continue brisk for forward deliveries, as those consumers who are under contract are anxious to cover their engagements at present ruling prices.

Floating business also remains dull. Shippers are holding out for higher prices than buyers are willing to pay. Freights having advanced we do not see any prospect of easier prices, rather the reverse, for as soon as the Admiralty requirements are definitely known, prices will doubtless be advanced.

Railway carriage and waggon builders are exceedingly busy, and shipbuilders being fully engaged for some long time to come,

a brisk business during the closing months of the year is fully anticipated.

In our last circular we referred to a telegram in the *Times* stating that 3,500 logs of Teak had been confiscated by the Siamese Government, which were intended to be shipped from Moulmein. The quantity should have been 35,000 logs.

**MAHOGANY.**—Considering this is usually a dull time, a fair amount of business has been transacted. The stocks in first hands are somewhat light, and the trade are looking forward to a continuation of steady business at present figures. Supplies from Honduras are required as the stocks are exceptionally small.

**CEDAR.**—Arrivals in quantity are causing speculators to hold off, and prices may drop again to last year's level.

**AMERICAN WOODS, WALNUT, WHITEWOOD, &c.**—There is very little demand for timber, but a considerable turnover in imported cut stuff. Large arrivals of mixed goods are reported, and some forced sales are expected before the end of the year, with lower prices. Stocks of Oak boards are being pushed upon the market with depressing results.

**SEQUOIA** has been having its fair share of business, and a few good lines have gone into consumer's hands at remunerative prices.

**AMERICAN ELM.**—Several prime parcels have arrived lately and will no doubt meet with a ready market, as the prices now ruling are much easier than those quoted at the early part of the season.

**GREENHEART.**—Business is practically at a standstill as there is at present no demand whatever. Stocks are small and mostly of an inferior character.

## ANGIER BROTHERS' STEAM FREIGHT REPORT, September, 21st, 1889.

FREIGHTS during the past fortnight have worn a dull aspect, the demand has been very inactive, and rates in most trades have further given away. In China waters and the far East employment has been and continues scarce and poor, excepting a slightly improved demand for near tonnage in Australia. India has taken very little and steam tonnage thence is not easily placed, though the rates quoted from Calcutta, Madras Coast, Bombay, and Kurrachee show but little alteration. Black Sea business has been and continues very slack at reduced and now decidedly low figures. Azoff rates have suffered least, the last transactions thence showing higher prices in proportion than Odessa and Danube; prompt tonnage is least in favour. Mediterranean Ore and Fruit rates are low, and the enquiry for steamers limited. Baltic business has been poor both for Deals and Grain. The American market has been well sustained, the supply of tonnage for September loading being well within the requirements. Cotton rates have ruled high and a good number of boats have been placed. Grain freights, too, have kept up well, resulting in fixtures reaching into December loading; oil and berth rates are proportionately fair. A few more boats were placed for grain from U.S. to South America. From Canada a fair number of steamers were taken for deals at full rates, and berth ships made good lump sums. From the Brazils and River Plate there is more demand, but at rates too low to show profit, the heavy expenses at these ports, added to the long delays in loading and discharging, spoil all chance of profit except at much higher freights than are now ruling. Outward coal rates have improved to the Mediterranean and a number of ships been fixed, but to the East rates are low. To the River Plate and Brazils rates are maintained and should advance to cover the risks of these trades. But few time orders are now offering even at reduced figures.

Builders prices for new tonnages are necessarily high with the still increasing cost of materials and labour; second-hand tonnage finds a fairly ready sale at full values.

The end of the dockers' strike was welcomed by shipowners, they having been the main sufferers. Scarcely had the docker's recommenced work before the dock directors brought out a proposal to increase the dues on ships from 1s. to 1s. 5d. per ton, besides other increased charges, and to abolish overtime work, as the consideration for allowing owners to discharge their ships with their own labour. The proposal could not be considered seriously; London docks and port charges are already too high and militate against its trade. The number of law cases arising from the detention of ships, against the dock companies and merchants will bring profit to the legal profession.

## INDUSTRIAL AND TRADE NOTES.

## THE CLYDE AND SCOTLAND.

**M**ATTERS continue to be thoroughly brisk in the shipbuilding, engineering, and cognate industries of the Clyde and other Scottish ports. Excepting that firms have great trouble in urging forward steelmakers, founders, and other subcontractors, with the despatch desired, and that workmen—of the "black squad" order chiefly—give trouble in connection with increase of wages and loss of time, the lot of the Clyde shipbuilder and engineer is at present, in Gilbertian phrase, quite "a happy one." But even in the respects named he is not so badly off, because, through long and painful experience he has learned to protect himself against anything like heavy claims for detention in delivery by skilfully worded "Strike Clauses," &c. It is now very rarely indeed that any question of detention has terrors for the shipbuilder or engineer behind time. He can generally meet the charge with the rebutting one of "wages strikes" or "wretched delivery" of material! Thus, strikes have their redeeming side, even for the harassed employer of labour.

New orders have not been so plentiful since last report; but it should be remembered that many of them are booked, and nothing said about it. "Fuss made over new orders," according to a long-headed Clyde shipbuilder, "quite demoralises the workman!" At all events there is no gainsaying the fact that in busy times such as we are having, and especially with every prospect of their continuance, employers can rely far less on a stated and steady working day than during times when work is scarce and prospects gloomy.

Messrs. McKnight & Co., of the Slip Dock, Ayr, contracted at the latter end of August to build a powerful tug for a Liverpool firm, the engines of which are to be supplied by Messrs. Ross & Duncan, Govan. Messrs. McKnight & Co. have also contracted to build for Messrs. Beacon & Co., Liverpool, two screw steamers of 700 tons. Messrs. Muir & Houston, Govan, will construct the engines. Messrs. McKnight have at present on the stocks four steam steel vessels, two of which are advancing towards completion.

For London owners, Messrs. Murray Bros., Dennystoun Shipyard, Dumbarton, have contracted with Messrs. Kincaid & Co., Limited, Greenock, to build a screw tug, the machinery for which will be supplied by the last-named firm.

Messrs. Robert Duncan & Co., Port-Glasgow, have contracted with Mr. T. C. Guthrie, Glasgow, for the construction of a large four-masted steel sailing ship, as an addition to the Village Line.

Messrs. John Fullerton & Co., Paisley, have contracted with Messrs. James Hay & Co., Glasgow, for the construction of two screw steamers of about 500 tons. Messrs. Muir & Houston, Govan, will construct the engines.

The Abercorn Shipbuilding Co., Paisley, have contracted to build a screw steamer of 185 ft. in length, which will be supplied with powerful engines.

Messrs. Russell & Co., Port-Glasgow, have arranged with the Dundee Shipowners Co. to construct a steel sailing barque capable of carrying 2,200 tons deadweight, which will be a duplicate of the *Glenmark*, launched by Messrs. Russell & Co., some months ago, for the same owners. This energetic Port-Glasgow firm have also contracted with Messrs. Thomson, Dickie & Co., to build a first-class steel sailing ship, 1,700 tons, to be employed in their general trade. She will have a carrying capacity of 2,850 tons deadweight.

At Partick and Govan, shipbuilders are fully stocked with work, and berths are not allowed to remain long unoccupied. The latest order reported is that booked by Messrs. D. & W. Henderson, for a large steel steamer, to be employed, it is said, in the opium trade, between Calcutta and Hong-Kong.

Messrs. Simons & Co., of Renfrew, are, like their neighbours, excessively busy, a large proportion of their work consisting of the dredger class of vessel; a speciality for which their name is now almost world-wide. The most recent order of this kind received is for a screw steam hopper-dredger, to be employed in the service of the Manchester Ship Canal Co. The vessel, which is to be of 850 tons capacity, besides having the traversable dredger patented by Messrs. Simons, will have other improvements; and the engines will be two sets of the union type. In many respects this dredger will be one built by this firm two years ago for the Bristol and

Navigation Trustees, in addition to ordering the

large cross-river vehicular ferry with elevating platform from Messrs. Simons & Co., have asked to be supplied with designs, specifications, and estimates for an addition to their fleet of up-and-down Harbour Steam Ferry Boats. The boats are to be propelled by steam or other vapour, and to embrace such improvements on the present boats as designers think proper to suggest. Designs were lodged with the general manager of the Trust on the 20th Sept. last, and it is probable orders will be given very shortly.

Mr. John Burns, of the Cunard Line, who is a warm supporter of the training-ship movement, has been informed by the Admiralty that the *Revenge*, presently the flagship at Queens-town, will be sent to the Clyde in October to replace the *Cumberland* training-ship, whilst H.M.S. *Triumph* is now being fitted-out at Devonport with all despatch to take the place of the *Revenge* at Queenstown.

An influential syndicate of business gentlemen in Glasgow and Edinburgh, are projecting a scheme for the construction of a ship canal from the Forth to the Clyde, and already considerable progress has been made in preparing plans and information required for supporting an application at next session of Parliament for an Act to empower its construction. The canal will be on such a scale as will admit of the rapid and safe passage of the largest class of merchant and war ships. It will begin probably near South Alloa and proceed via Stirling, and the Forth and Endrick Valleys, to Loch Lomond, from which a passage will be formed, either via Tarbert to Loch Long, or from the southern extremity of the Loch to the Clyde. In all probability a connection will be made with the Clyde near Glasgow, to accommodate the city. Though the route selected is somewhat circuitous, it possesses some important advantages not to be overlooked. The works will be comparatively easy of construction, and the cost correspondingly small, the estimated cost being £7,000,000. Throughout the route only four locks will be necessary, and vessels will always pass at once from deep water into the canal, and *vice versa*; and the Clyde Trustees, charges will be avoided; three very important considerations. The engineers engaged are the well known firm of Messrs. D. & T. Stevenson, of Edinburgh, who are stated to have prepared a preliminary report, in which they show that the scheme really presents no engineering difficulty which cannot easily be overcome, and that, so far as they are able to judge from an examination of official shipping and trade returns, it will be financially successful.

The Greenock Harbour Trust appear to have weathered their difficulties of a few years ago. At the time of its completion, the James Watt Dock was hardly warranted as an enterprise by the amount of business available, and the situation was further complicated by the projects of the Clyde Trustees in deepening the river and the Port of Glasgow to have them available for vessels of the largest tonnage. Within the past few months, and especially since the recent strike of seamen and firemen on the Clyde, the great facilities and ample accommodation available at this magnificent dock have attracted some of the leading shipping lines trading between Glasgow and New York. During the course of the strike the State Line Steamship Co., the Anchor Line Co., and other important shipping lines, made practical experiment of the facilities offered at the dock, with satisfactory results, and it is not beyond the bounds of possibility that one or more of these companies may make it their future loading port.

Possibly in the course of a year or two both Greenock and Glasgow may have to reckon with an active competitor in the shipping trade. The new dock and harbour works at Ardrossan are nearing completion, and they will elevate this port into one of the first-class, with easy access to the Ayrshire and Lanark coal and iron fields, and with exceptionally good railway facilities. Recently the Caledonian Railway Co. opened up direct communication from Glasgow with Ardrossan, and they will shortly have their lines along the quays of the new dock. The Glasgow and South Western Co. have their lines in connection with the present dock, and they will also have connection with the new works. A breakwater is in course of construction, which will enclose a fine anchorage space of several hundred acres. By dredging operations this harbour may be rendered available for ships of any tonnage, and while the accommodation will in all likelihood meet the wants of Ardrossan for many years to come, further extensions are possible at a moderate expenditure.

Great progress continues to be made with the Seafield Dock and Railway on the coast of Fifeshire, near Kirkcaldy, and so far as the operations in connection with the railway, and pre-

paratory to the construction of the dock are concerned, the work is now general, covering an area of three quarters of a mile in length.

The shipyard at Alloa, occupied by the Grangemouth Dockyard Co., continues to be fully employed, and in order to provide for the growing requirements the company are putting in additional plant, including a large punching and shearing machine, and pneumatic rivetting plant. The company are also arranging to construct a patent slipway in connection with the works, sufficiently large to take on the largest vessels coming up the river, for executing repairs.

The prospectus of the International Exhibition of Electrical and other Engineering matters, which has been arranged to be held in Edinburgh next year, has been officially passed for publication, and will soon be issued. The list of sections is a pretty exhaustive one, and many highly important exhibits are promised. The whole exhibition is apportioned into three general divisions, each with a number of sub-divisions. The first section is devoted to Electrical Engineering and Industries, and is divided into six sub-sections; the second embraces General Inventions and Industries, with sixteen sections; and the third general division is devoted to Fine Arts. It is intended to publish the prospectus in the French as well as in the English language. At a meeting of the Executive on the 19th ult., Councillor Pollard was unanimously elected treasurer of the Exhibition, and Mr. S. Wade was appointed agent at the present Paris Exhibition for securing exhibits.

Of the six candidates who made application for the Chair of Civil Engineering and Mechanics, in Glasgow University, recently vacated by Professor James Thomson, resigned, the successful one is Professor Archibald Barr, of the Yorkshire College, Leeds. Professor Barr is a Clyde man, having begun his professional education in the works of Messrs. A. F. Craig & Co., Paisley, which he entered in 1871. Two years later he commenced his engineering studies at the University, and pursued the complete course, graduating B.Sc., and receiving also the Certificate of Proficiency in Engineering Science. At the end of his apprenticeship Mr. Barr received the appointment of private secretary to Mr. Charles Randolph, founder of the firm of John Elder & Co., now the Fairfield Shipbuilding and Engineering Co., but he had not long occupied that position when the "Young" Assistantship in Engineering at the University was founded, and he at once accepted the post, which was offered him by Professor Thomson. Eight years of teaching at the college, supplemented by much practical work carried out during the holidays, fully qualified the young engineer for the appointment he received in 1884, and has held since, that of Professor of Civil and Mechanical Engineering in the Yorkshire College. He had to remodel the engineering department, and did so upon the basis of the courses of instruction given by Professor Thomson, his old teacher, in whose stead he is now to reign at Glasgow.

## TRADE NOTES FROM THE TYNE, WEAR, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—Extreme activity continues to characterise the whole of the shipbuilding establishments, and with every recurrence of the "spring-tide" period, several thousands of tons of new tonnage are put off the stocks. It is indeed beginning to be apparent that the present rate of production cannot be maintained for more than another year or so, as the monthly additions to the Register are outnumbering the withdrawals, and this is being done at such a rate that, in the opinion of competent judges, the requirements of the world's commerce must soon be fully overtaken. In the meantime, enquiries are said to be numerous, and any shipbuilder who desires to further swell his list of contract engagements, should have little difficulty in doing so. It is to be hoped, however, that the experience of 1883, when almost every firm on the North-East Coast had vessels left upon their hands, will have the salutary effect of causing builders to keep prospective business transactions within safe limits. During the past few weeks exceptionally rapid progress has been made with the building of the Admiralty war sloop which Messrs. Hawthorn, Leslie & Co. have in hand, and the vessel is now so far advanced that the probability of her removal from the stocks in the early days of 1890 is talked of. A large twin-screw passenger vessel, which is being built by the firm for a Russian company, is to be launched early in October, and a twin-screw steamer of smaller size—the second of two

duplicate vessels ordered by Brazilian owners—is expected to leave the stocks a fortnight later. Messrs. Armstrong, Mitchell & Co. have two large oil-carrying steamers nearly ready for launching at their Low Walker yard, and have a couple of cruisers in advanced stages at their Elswick establishment. Messrs. Dobson and Messrs. W. Richardson & Co. have each a large vessel almost ready for leaving the stocks, and the latter firm are busily fitting out one beside the yard. Messrs. Swan & Hunter have five vessels in various stages of progress on the stocks, and Messrs. Schlesinger, Davis & Co. have an equal number in course of construction. At the time of writing, however, the latter firm have two berths vacant, but it is possible that one or both may be filled up by the end of the month. Messrs. Palmer & Co. have recently launched a fine steamer named the *Inchinnan*, which has been built to the order of a Liverpool firm, and another named the *Wansbeck*, ordered by Newcastle owners. The *Lady Palmer*, which was launched some time since, is still waiting to receive her machinery, and there are besides two vessels at the sheerlegs; two occupying the graving dock and slipway; and 13 on the stocks of the Jarrow and Howden yards. Messrs. R. Stephenson & Co. have four cargo steamers of large tonnage in progress, and have commenced the construction of the cruiser which fell to their share out of the late distribution of orders by the Admiralty. The Tyne Iron Shipbuilding Co. have a cargo steamer 300 ft. long, well advanced in plating, and two others of similar size in earlier stages. The repairing establishments are generally very well employed, and a further accession of business is anticipated through the termination of the London dock labourers' strike, which, during its continuance, had a specially damaging effect upon this branch of trade. The Mercantile Dry Dock Co., Jarrow, have now got their dock and works in full operation, and have, since the opening of the dock last month, executed extensive repairs to a number of steamers. The company are now negotiating for other contracts, and their prospects for the future appear to be encouraging. Messrs. T. & W. Smith are finishing beside their quay the s.s. *Rondo*, of about 1,650 tons carrying capacity, and have another of similar dimensions on the stocks. Frames are daily expected to arrive for a steamer of 900 tons carrying capacity, ordered by local owners. The firm are also engaged in carrying out repairs of a rather extensive kind to two locally owned steamers.

**Engineering.**—The Wallsend Slipway and Engineering Co. have a large amount of work in hand, and several sets of engines and boilers are completed, and ready for placing in the vessels for which they are intended. This firm, in common with others, are finding the increased cost of production, brought about by the recent rise in the price of labour, to be a very serious obstacle to the acquisition of new business. Messrs. Hawthorn, Leslie & Co. have found it necessary to make considerable extensions at their St. Peter's Works, to meet the largely increased requirements of their business. Messrs. Black & Hawthorn have engined an exceptionally large number of boats this year, and have still, it is understood, more than a score of vessels to fit with their machinery. They have also a good deal of work in their locomotive department. Messrs. Hawks, Crawshaw and Co.'s extensive works at Gateshead are now inoperative, excepting a portion of the "high mill" which is kept going temporarily. Messrs. Abbot & Co. have acquired a part of the river frontage which formerly formed part of Messrs. Hawks' premises, and intend utilising the same to increase the quay accommodation in connection with their establishment. Messrs. Abbot are at present doing a very active business, particularly in the rolling mill and chain and anchor shops. Active preparations are being made for putting the Don Iron Works, Jarrow, in operation by the end of the present month, and no doubt is entertained that a start will be made by the time indicated. Messrs. Lysaght & Co., of Wolverhampton, are the chief movers in this enterprise, and there is every reason to expect that in their hands the business will be conducted in a way calculated to ensure success. The well-known establishments of Messrs. Emerson, Walker, & Thompson Brothers, at Dunston and Winlaton, continue exceedingly busy, as much so indeed as they have been at any time since the brisk period in shipbuilding and engineering commenced. The engine works are kept fully going upon patent steam and other windlasses. The firm have secured most important orders in this branch, and the prospect of sustained activity for a lengthened period is consequently assured. The forges and smiths' shops are also very busy, amongst the contracts in these departments being some fine specimens of light

steel forgings, including crank shafts, girders for locomotive combustion chambers, and other engineering accessories, to the manufacture of which this firm are giving special attention. The works of the firm at Winlaton are very actively employed, the chainmaking department being specially brisk. Besides the work in hand, the firm have some good orders for ship's tackling and other fittings yet to be executed, and full employment during the winter months may therefore be calculated upon. Messrs. Spencer & Co.'s works at Newburn and Newcastle continue to show exceptional activity, the department which is devoted to the manufacture of Mr. Wasteneys Smith's patent stockless anchors, being busier than at any former period. In this connection it may be stated that Mr. Smith has recently been favoured with a large number of new orders for this well-known type of anchor, from shipbuilders both at home and abroad, one firm alone having given him the contract to supply the anchors for fourteen large steamers. In nearly all departments of Messrs. Armstrong, Mitchell & Co.'s Works, including the ordnance and engineering shops, and the steel works, hands are being taken on, and no better sign of prosperity need be looked for. This great company have just declared a dividend of 11 per cent. for the year ending June 30th. Messrs. Palmer & Co.'s newly erected supplementary rolling mill is now in full operation, and most satisfactory results in the way of rapid and economical production are being achieved. The Walker blast furnaces, which were only lit up about a year ago for the smelting of "Gellivara ore," after a stoppage of several years, have been again "damped down," the cause of the latest stoppage being, it is understood, a difficulty in getting supplies of the ore. Nothing definite is known as to the future course of events in connection with these furnaces, but it is thought probable that they may start again shortly. Both forges and foundries in all parts of the district are very busy, and the greatest difficulty the proprietors of these establishments have to contend with is the getting of sufficient labour to carry on the work.

#### THE WEAR.

**Shipbuilding.**—At the time of writing some important launches are being prepared for, among which may be mentioned a large vessel for the Australian trade, on the stocks of Messrs. J. L. Thompson & Sons, and one which is to form an addition to the "Prince" line, in course of construction by Messrs. Short Brothers. It may be stated that the last-named firm have another vessel on the stocks, ordered by the owners of the same well-known line of steamers for whom they have already built some nine or ten cargo boats of a very superior class. Messrs. Pickersgill, whose present premises have not been extensive enough for the laying down of the largest class of vessels, have obtained possession of a piece of ground adjoining their yard, and are now carrying out the necessary arrangements for incorporating it with the latter. When this is done the firm will be able to lay down vessels over 400 ft. in length, and will in fact possess one of the most spacious establishments in the district. It is understood that they contemplate increasing their plant to an extent commensurate with their increased building space, and those who have noted the enterprising spirit shown by the firm since they commenced iron shipbuilding, some ten years ago, will have a confident expectation that now, when the opportunity is afforded them, they will not rest until they have supplied themselves with every modern requirement for economical production. The firm have at present three vessels on the stocks, and among the orders in reserve is one for a vessel to be over 350 ft. in length. Messrs. Doxford have, among other important orders, one for a vessel to be 365 ft. long, and of proportionate dimensions in other respects, for a London Shipping Co. At Mr. Laing's yard all berths are occupied, and there are also some repair contracts in hand. Messrs. R. Thompson & Sons have had their graving docks pretty constantly occupied this month, and very considerable progress has been made with the new work in hand at their Southwick yard. At the whole of the remaining yards business continues active.

**Engineering.**—The old established firm of Messrs. George Clark & Co. has been made a limited liability concern. The change, however, will not in any way affect the working arrangements, and things will continue to go on very much as they have hitherto done. At the Palmer's Hill establishment the pressure continues very great, and orders for Dickinson's Patent are very numerous. Night work is being con-

tinued in nearly all departments at the North Eastern Engine Works, and this state of matters must necessarily be maintained for a long time to come, as the firm are understood to have a large number of contracts yet to deal with. Messrs. Doxford have several sets of heavy engines in progress, and are employing a more than ordinarily large staff of men. Messrs. John Lynn & Co., manufacturers of steering gears, windlasses, steam winches, &c., are doing a most active business, and are keeping their machinery going to a late hour nightly. In addition to the work in hand from local firms, Messrs. Lynn & Co. have several foreign contracts in course of execution, and have recently sent a number of their specialities to customers at Trieste. Mr. A. A. Rickaby, of the Bloomfield Engine Works, Monkwearmouth, has an unusually large amount of work in progress, consisting of pumps, reversing engines, piston packing, and other engineering specialities. The whole of the forges are very actively employed, and the same may be said of chain works and rivet works. Operations have been commenced at the Wear Steel Co.'s Works (formerly Castletown Ironworks), and four furnaces out of nine, that are to complete the equipment of the establishment, have been started. The production, which at present and for some time to come must be comparatively small, is expected to reach a large figure in the course of a few months, when the arrangements for full work are completed. Messrs. Craven & Speeding, hemp and wire rope manufacturers, are just now exceedingly busy, and are likely to continue so for many months yet. The other rope manufacturers in the district are also doing well.

**The Hartlepool.**—The greatest possible activity continues to exist at the shipbuilding establishments, repair contracts forming no inconsiderable portion of the work in hand. At the marine engineering establishments the briskness is unabated, and night work continues to be carried on wherever practicable. During the past month Messrs. T. Richardson & Sons, have engaged the following vessels at their sheer legs:—The s.s. *Staffa*, built by Messrs. E. Withey & Co., for Messrs. Herskind & Wood, of West Hartlepool. This ship has engines 22 in., 35 in., 59 in., by 39 in. stroke, and two large single-ended boilers, fitted with Fothergill's system of forced draught. The air is supplied under pressure by means of a set of Chandler's high speed fans and engines. The s.s. *Apache*, built by Messrs. Raylton, Dixon & Co., for Messrs. Tapscott, of Liverpool. This vessel has engines 22 in., 35 in., 59 in., by 39 in. stroke, and two large single-ended boilers. The working pressure in each case is 160 lbs. On the 11th September, the s.s. *Inchmarlo*, built by Messrs. R. Thompson & Sons, of Sunderland, for Messrs. Hamilton & Fraser, had a most successful trial trip. The engines, which worked without a hitch, indicated 1,700 H.P. when working at 84 revolutions per minute. The *Inchmarlo* was fitted by Messrs. Richardson with triple-expansion engines, having cylinders 25 in., 40 in., 68 in., by 42-in. stroke. Steam at a working pressure of 160 lbs., is supplied by two large double-ended boilers. Messrs. Richardson have also been engaged for several weeks upon an extensive repair to the s.s. *Wimbledon*. The local steel works are kept briskly going, and at the rope works considerable activity may be noticed. Cement works are also very busy, and the same remark applies to saw mills and timber yards. Business at the docks is fairly active, timber imports being still very heavy. Coal shipments during the past few weeks have been somewhat larger than they were at the corresponding period of last year.

**Stockton.**—At the Stockton shipbuilding yards business is as brisk as ever, and the boiler shops and bridge yards are also in full activity. The following vessels, engaged by Messrs. Blair & Co., have had their trials since August 19th:—The s.s. *Tyne-dale*, built by Messrs. Ropner & Son, of Stockton, for C. Furness, Esq., having engines of 160 N.H.P., with cylinders 21 in., 35 in., and 59 in. by 39-in. stroke. The s.s. *Meggie*, built by Messrs. Richardson, Duck & Co. for Messrs. Burdick & Cook, of London, having engines of 155 N.H.P., with cylinders 21½ in., 35 in., and 59 in. by 36 in. stroke. The s.s. *Marion*, built by Messrs. Irvine & Co., West Hartlepool, for Otto Trechman, Esq., of the same port, having engines of 150 N.H.P., with cylinders 21 in., 34 in., and 56 in., by 36 in. stroke. The s.s. *Cambridge*, built by Messrs. C. S. Swan & Hunter, Wallsend, for the Great Western Steamship Co., Limited (Messrs. Mark Whitwell & Son, managers), having engines of 175 N.H.P., with cylinders 22 in., 36 in., and 59 in., by 39 in. stroke. The engines for all the above vessels are constructed to work at 160 lbs. pressure of steam, and on their trials they gave complete satisfaction. Messrs. Rogers & Co.,

manufacturers of steering gears, &c., are very busy, and Messrs. Ashmore, Benson, Pease, & Co., makers of gas plant, &c., are well supplied with orders. The iron works in the locality are kept going briskly, and steel manufacturers are finding it extremely difficult to meet the pressing demands of customers.

**Middlesbrough.**—Shipbuilding at this centre still exhibits great vitality, there being a large amount of new tonnage on the stocks, as well as a fair share of repairing work on hand. Messrs. Harkess & Sons have just launched a vessel of 1,200 tons carrying capacity, and have a much larger one now in progress. Messrs. Westgarth & English, marine engineers, &c., have now more work on hand than at any time since they commenced business. They are at present fitting with machinery at the shearlegs, four new vessels, two of which have been built at Middlesbrough, and one each at West Hartlepool and Stockton. The Teesside Iron and Engine Co., Limited, have decided upon a scheme which involves the voluntary winding-up and reconstruction of the company. It is expected that considerable advantages will result. The tug-boat owners of the Tees have intimated to the men in their employment that they will accede to a request, made some time ago, for extra pay for Sunday work. A dispute which arose recently between the metal carriers at Messrs. Bell Brothers' blast furnaces and their employers, relative to the conditions of work, is to be settled by arbitration. The steel works at Middlesbrough are, like similar establishments elsewhere, somewhat overburdened with orders, and new plant is being put down with a view to accelerate production. The pig-iron market is just now very strong, and forward contracts are being refused by makers, excepting when prices very considerably beyond the rates now ruling, are conceded. The price of finished iron has been advanced 2s. 6d. per ton, bringing the value of ship plates to £6 10s., and boiler plates to £7. The price of angles, at the advanced rate, is from £6 2s. 6d. to £6 17s. 6d. per ton. On the whole it may be stated that the value of finished iron has increased by 10s. per ton since March.

**Darlington.**—The greatest activity continues to exist at the Darlington Forge Co.'s works, and several special contracts have been completed during the month. The branch of the company's works which has been started at Wallsend is also kept in very active operation. Waggon works are fairly busy, and other branches of industry at this centre are generally prosperous.

### THE MERSEY.

**M**OST of the engineering and shipbuilding yards are now full of work, and the prospects of improved trade anticipated at the commencement of the year have been more than realised; prices are better for all classes of machinery, and many of the shops are working overtime. Strong evidence of the improvement of trade lies in the fact that in several recent competitions for important works many of the well-known firms refused to tender, whereas this time last year many would have been glad of an opportunity to do so.

The import of timber has been unprecedentedly large during the last month, being almost double the amount imported in any August for the last five years, the increase being chiefly in spruce deals and birch. This excess is due not so much to the increased production abroad as to the employment of a greater number of steamers than usual, shippers having also taken advantage of the present low freight and insurance. Although the consumption has also been large, many of the stocks are very heavy, and are being stacked to maintain the prices; for it is evident that future deliveries will be on a much more limited scale. The deliveries of New Brunswick and Nova Scotia deals amounted to 24,100 standards, the stock now being very heavy; the arrivals of Quebec pine and spruce deals have also been heavy. The imports of yellow pine waney have been moderate, the demand moderate, and the stock light; square pine has been freely imported, and stocks are accumulating. Large size redwood is in fair demand, the smaller sizes being unsaleable. There was a marked improvement in the tone of the market at the recent auction sales of furniture woods, and good prices were maintained. For straight and sound Honduras mahogany there is a good demand at remunerative prices, the stock is light, and there cannot be any further supplies for some months to come; the market is bare of Tabasco, and there is a good opening for future consignments. There is a small demand for American walnut, the arrivals having been large; Italian and Circassian is seldom asked for. The stock of satinwood and rosewood is practically exhausted.

### WELSH NOTES.

**T**HE chief subject of discussion in South Wales during the past month has been the war of rates between the Taff Vale and Barry Companies. Before the Barry Dock and line were opened we were all asked to believe that there was room for both Cardiff and Barry, and that the two would simply toss up as it were for the respective rôles of lion and lamb, and straightaway jog along in quite a pleasant way. Few people believed that this would be so, however, and their belief has been justified. At the annual meeting of the Barry Co., Mr. David Davies, the vice-chairman, said that they would at all times charge the same rates on coals from place of production to their docks as the Taff Vale Co. charged to the Bute Docks. Within a few days the Taff Vale Co. made a considerable reduction in their rates, and this was at once followed by Barry. The result, if the war be continued, will mean a very considerable reduction in the sum the older company will have available for dividend at the end of the current six months. How Barry will "stand the racket" remains to be seen. But whatever the result, there can be no doubt that the rate cutting policy is a mistake. The latest phase of the dispute is a cutting of dock dues. A number of coal charterers interested in the Barry enterprise have been insisting that ships loading under their charters should load either at Barry, or Penarth, or if Cardiff was preferred by the owners, then 3d. less freight should be accepted. To meet this, shipowners are endeavouring to arrange terms with the Bute Dock Co., whereby those of the former who resort solely to the latter docks will receive a substantial reduction in dues. It is said that one important shipowner, Mr. T. R. Thompson, is much averse to any such arrangement as this being made by the shipowners. The opinion of this gentleman would be of the smallest possible importance were it not that he is on the board of the Barry Co., and has stated that if the Bute Co. come to such terms as are suggested by the shipowners, the Barry Co. will at once reduce their dock dues accordingly. It is all very well for the Barry directors to pursue the course they are pursuing, but their action assumes a different aspect when it is borne in mind that they, as coal charterers and shipowners, will be individually something into pocket by this rate cutting. If they make nothing out of their dock shares except their dividend fees they yet have an interest in the Barry Dry Dock monopoly, and, say, an increased profit of sixpence per ton on their coal shipments due to this rate cutting.

Whilst the Cardiff coal shippers are enjoying themselves in this way, the Swansea merchants are feeling anxious as to the effect the reduction on rates to Cardiff will have upon the trade of their port. No reduction has been made on railway rates to Swansea, and seeing that Rhondda Valley coal is seldom sent to Swansea under any considerations, it is perhaps difficult to see why any reduction in rates is necessary. The Swansea men think otherwise, however, and with that peculiar method, for which they are distinguished, held a hole-and-corner meeting a few days since to consider the question. Their position is simply this: Their coal supplies come from the local coalfields, from the Bridgend Valleys, from Aberdare, and a small quantity from Mountain Ash. The rate cutting does not affect either the local coal, or that from the Bridgend district. The stuff from Aberdare will cost more, but we are informed by the Railway Co. that the quantity from this district shipped at Swansea is extremely small. As to the coal from the Mountain Ash district, it is chiefly Nixon's navigation, and people who take such a luxury will pay a few pence per ton more without any hesitation. At present the rate on coals from the Bridgend district is about 2d. per ton less to Cardiff than to Swansea, although the distances are practically the same, and it is to be hoped that this will be altered. But the attempt has been made very many times, and the text upon which the Swansea men preach their new sermon to the G.W.R. on the desirability of reducing these rates, is one not calculated to bring about any different result this year to the previous attempts.

Newport's coal trade continues to decrease and the merchants of the place seem in a fix. They put all the blame upon Sir George Elliott and his Alexandra Dock Co. At a recent meeting of the Newport Chamber of Commerce, the chairman said it was ridiculous that these docks should be managed from London, and bitterly complained of the discourtesy of Sir George Elliott. This gentleman had been requested three months since to meet the Executive Committee of the Chamber to discuss the serious falling off in the port's trade, but has not

even replied to the communication sent him. This ignorance of the rules of common politeness seems to me a failing possessed by everybody in connection with the Newport Alexandra Dock Co. Our readers will remember that we related our own experience of this in our recent article on Newport. As one instance of the manner in which the bad management of the Newport docks drives trade from the port, the instance of Nixon's Navigation Co. was given. This company has been mulcted to the extent of £500 per annum in night-work charges, with the result that Nixon's coal is now sent to Cardiff in greater quantities than ever.

Within the past few days a rumour has been circulated that the Briton Ferry Iron Works are about being restarted. The news is too good to be true. The present possessors of the works ask a price many thousands too much for plant which is almost useless for all practical purposes, and no firm, however enterprising, could commence operations with some £40,000 of dead capital on their shoulders. Such things possibly were once done in Wales, but of late years the local banks have become more careful.

Some statistics of the tinplate trade, issued in August, are interesting. Although the shipments for that month show a falling off as compared with the corresponding month in 1888 they show an increase over the corresponding month of 1887. For the eight months, however, figures are very satisfactory. Thus, in 1887, the eight months' trade was 235,901 tons, value £3,179,726; in 1888, 263,562 tons, £3,797,592; in 1889, 290,832 tons, £4,027,541.

Further information is to hand concerning the manufacture of tin plates in America. The United States Tinplate Co., it is stated, has secured a site in the Exhibition ground at Pittsburgh, where a tinplate making plant will be erected to show that the plates can be made in the States. No doubt they can be made, but what will the cost be?

Measures are being taken at Swansea to make it a better coal shipping port than has hitherto been the case. Two new coal tips are being erected, and, when complete, they will be four inches higher than any in the Bristol Channel, the wonderful Barry not excepted. In addition to this, increased siding accommodation, has been provided.

The coal shipment for August, from Bristol Channels ports, shows a falling off of 59,000 tons as compared with the shipments of the previous month. Cardiff shipped 689,878 tons against 767,808 in July; Newport, 171,513 against 178,049; Swansea, 86,892 against 86,928. In patent fuel, however, Cardiff showed an increased shipment of about 3,000 tons; whilst Newport decreases in this trade 3,000 tons, and Swansea close upon 8,000 tons.

By the way, new fuel works are being erected at Swansea East Dock by Mr. William Westlake. They are of an entirely new system, and in a future issue we shall probably have an article specially devoted to them. On the side of the East Dock the works are just where they will prove most valuable.

A beginning has been made with the Vale of Glamorgan Railway, but it is yet too soon to say anything as to when the line will be completed. The folly of prophesying unless one knows has been amply experienced in connection with the Rhondda and Swansea Bay Railway. It should have been opened a year ago. At the last meeting, November was announced as the month when it would be possible to get Rhondda coals to Swansea, and now March is talked of. There have been disputes with the contractors, a local firm, and now the work has been turned over to Messrs. Lucas & Aird. Why such a firm was not selected at first is what many people would like to know.

The local iron and steel manufacturers have apparently satisfied themselves that the trade improvement is something more than a momentary spurt. Some of them have already increased their men's wages by five per cent, and have promised a further increase, on the 1st of next month, of two-and-a-half per cent.

Generally prices are firm. Steam coals are in demand at from 12s. 3d. to 14s., and coke ranges from 20s., f.o.b., for furnace, to 26s. for foundry. Pig-iron is good, and on 'Change one comes across men who have made good profits out of warrants, and who mean to hold for higher prices yet. Tinplates still drag. Why this should be so we scarcely know. Raw materials keep hardening, and plates should go up accordingly; but, somehow, they fail to move quickly enough. Certainly prices this month show some improvement, but by no means enough. If makers would get rid of their old-world sell to consumers direct, it would be much better

for the trade. Our own opinion is, that there are too many petty shopkeepers and such like men in the trade. On 'Change one is constantly coming across such men; they may know all about selling 1½lb. of tea, or they may even be able to take a photograph, but when tinplates and big buyers come on the *tapis*, they are at sea. We are by no means joking when we write thus; we are only too sorry to find one of Wales' staple trades in such a position, and from such causes.

## BELFAST TRADE NOTES.

THERE is still the same pleasant report to make, viz., that the shipbuilding and engineering trade is in a very busy state here.

Messrs. Harland & Wolff, Queen's Island, have at their jetties in the Abercorn Basin, the ss. *Majestic*, White Star Liner, sister ship to the ss. *Teutonic*, ss. *Yorkshire*, built to the order of Messrs. Bibby Bros. & Co., Liverpool, and the ss. *Amur*, recently launched for Messrs. Johnston, Liverpool. At all of these they are very busy, the ss. *Yorkshire* being almost ready for sea, they have also three large vessels almost ready for launching.

During the month they had under repairs one of the torpedo boats engaged in the recent naval manoeuvres, which had got her stern and propeller injured.

The Marquis of Dufferin and Ava was a visitor to the works during the month, and went through the ships now finishing, including the ss. *Majestic*.

Messrs. McIlwaine & Maccoll, Limited, shipbuilders and engineers, are also pretty busy. The ss. *Andes* of the Atlas Line, and which is receiving very extensive alterations and repairs at their hands, is at present in the Alexandra Graving Dock.

S.S. *Monarch*.—This steamer, owned by Mr. King, Belfast, got ashore on the County Antrim coast, and received injuries which necessitated her being placed on the slip. Messrs. McIlwaine & Maccoll have also this vessel in hand. S.S. *Adula*.—This fine screw steamer, built and engined by Messrs. McIlwaine & Maccoll, left here on Sept. 12 for Newport, to load for the West Indies. Messrs. Leach, Harrison & Forwood, Liverpool, are the owners, and she is intended for their trade in the West Indies.

In their shipyard they have two vessels ready for launching.

Messrs. Workman, Clarke & Co.'s, Belfast, shipyards are also very busy, and will have launches shortly. They have contracted with Messrs. Hugh Craig & Co., Coal Merchants, Royal Avenue, Belfast, to build a steel screw steamer for their trade, to be 450 tons burthen, and capable of steaming at 11 knots per hour loaded. She is intended for Messrs. Craig & Co.'s trade between Belfast and the English and Scotch ports.

Messrs. Victor, Coates & Co., Limited, Prince's Dock and Lagan foundries, are fairly busy. The ss. *Allie*, Hartlepool, was in their hands for repairs since last report.

The fitters employed by them struck for an advance of two shillings per week, which was granted to them. This brings them up to the general rate in the engineering trade here, viz., 33s. per week.

Messrs. Coates have secured the order for the engines and boiler for the new steamer which Messrs. Workman & Clark are about to build for Messrs. Craig & Co., Belfast.

Additions have been made to the Quay railways for some time past, and the quays of Belfast can compare favourably with any other port for the facilities afforded for ready conveyance of cargoes to or from steamers.

The new 100-ton derrick crane is being very slowly completed, what has been erected of it has a fine appearance.

The Blue Dock.—The tender of Mr. James Henry, Belfast, to construct the second portion of this dock at £18,500 has, it is stated, been accepted. This dock, when completed, will be 1,000 ft. long on both sides, and will accommodate vessels drawing 26 ft. of water.

Mr. A. B. Forwood, M.P., Financial Secretary to the Admiralty, visited Belfast early in September, and also visited Derry, where he went through the Foyle shipyard (Mr. Charles J. Biggars).

The U.S. steam frigate *Enterprise* called in Belfast Lough, she is commanded by Captain McCalla. The *Enterprise* is a vessel of 1,374 tons gross, has engines of 800 H.P., and carries 6 guns, she has a crew of about 170 men, and is on a cruise round the British coasts.

The famous racing yacht, *Irex*, has just been sold at Torquay by Mr. Jamieson, of Belfast, to one of the Russian princes. She leaves for Plymouth in the course of a few days, where she is to be joined by her new owner, after which she will proceed to Russia. Mr. Jamieson has given Mr. Fay, of Southampton, an order for the construction of a new yacht, which is to be built from designs by Mr. Richardson, of London, under the superintendence of Captain O'Neil, of the *Irex*.

### LEITH NOTES.

THE shipping and engineering trades in Leith are now busier than they have been since the great spurt in 1883, and orders continue to come in steadily. Of new orders placed, Messrs. S. & H. Morton & Co. have been successful in receiving two, for steamers of the following principal dimensions:—One, length, 190 ft. beam, 30 ft. depth, 15 ft. to be supplied by them with engines 14 in., 23 in. and 37 in. by 30 in. stroke; also an awning deck steamer for a Norwegian firm in Bergen, to be 180 ft. long, 28 ft. beam, by 12 ft. depth of hold, with engines 16 in., 26 in. and 40 in. by 30 in. stroke. Messrs. Ramage & Ferguson have lately concluded two new contracts, one for a large sailing ship of about 2,500 tons deadweight capacity for a Dundee firm. The new vessel is to be a sister ship to the *Castor*, built about three years ago for the same owners, and one for a magnificent auxiliary steam steel yacht, built to the order of W. C. Storey, Esq., Regent Street, London, 200 ft. long, to be supplied by the builders with engines to indicate 800 H.P.

Messrs. Hawthorn's and Messrs. Cran have been successful in securing numerous repair orders.

Of work on hand, Messrs. Morton have three vessels building, Messrs. Ramage & Ferguson five, and Messrs. Hawthorn's two. There were two launches this month, one from Messrs. Ramage & Ferguson's yard, and one from Messrs. Hawthorn's. The docks here are busy, and several large cargoes have arrived during the past month. Outward freights are keeping up, but home freights from the Baltic are drooping, owing to the large shipments which occurred in the earlier part of the year.

### Miscellaneous.

THE NAVIGATION OF THE RED RIVER OF TONQUIN.—The last mail from the East brings news of the successful navigation of the Red River of Tonquin from Hanoi to Laokay, near the Chinese frontier, by a steamer specially constructed for the purpose for Messrs. Marty & d'Abbadie, of Haiphong, the chief port of Tonquin. For some years past this firm has had steamers running in the canals and rivers of the delta, between the sea and Hanoi, a distance of 120 miles; but of late it has been assumed that the upper course of the Red River was not navigable for steamers on account of the shallows and rapids. The new steamer is described as propelled by a paddle-wheel hung over the stern, the boiler being on deck forward, and for some time she had been running between Hanoi and Tuynen-Kwan, until a few years ago the outpost of the Black Flags. Her success here induced Messrs. Marty & d'Abbadie to attempt the navigation of the upper river, and in the first week of July a start was made. The rapids above Tankwan were hitherto considered impassable, three gunboats, specially constructed for the French Government for the purpose, having failed to surmount them in 1887, and having been seriously injured in the attempt. The steamer passed them, but soon afterwards grounded, and by a sudden fall of the water was left half afloat for eight days. But a freshet coming down, the water rose 9 ft. in a single night, and the vessel pursued her way to Laokay, where she arrived safely on July 24. Here she was received with much enthusiasm on the part of the garrison and much wonder by the natives, who had never before seen a steamer. After a day's rest the descent commenced. This was dangerous owing to the rocks in mid-channel, which will have to be blown up before regular traffic can be carried on with safety. On the 28th Hanoi was reached. The owners are stated to be constructing another steamer of a similar kind, but larger, for the trade which is expected to follow the navigation of the river from the Chinese frontier to the French settlements in the delta and the sea.

A novel departure from the ordinary course of things was

witnessed at Portsmouth on September 19th, when the sets of triple-expansion engines, manufactured by Messrs. Hawthorn, Leslie & Co., for the *Barham*, were separately lifted on board bodily. Each set of three cylinders was despatched from the works with all their packing and connections complete, and in this state they were lowered into their proper positions without being taken to pieces. This was the first time such a feat has been accomplished with engines of that size. The sets weighed about 22 tons each, and the operation will save a great deal of time. The engines have also the further distinction of being the lightest for the power to be developed on trial of any hitherto introduced into the service, their weight being less than those of the *Barrosa*, which have only to indicate 3,000 horses, while the *Barham*, which is of 1,830 tons displacement, has engines of 6,000 H.P. The lightness of the machinery, which is a repeat of that of the *Bellona*, has caused much comment among naval engineers. The standards which usually support the vertical cylinders have been dispensed with, and exceedingly light framing has been substituted. This framing, however, is tied together by longitudinal and diagonal girders. The *Barham* is built without the protection of a double bottom, and in order to economize weight the plummer blocks are placed direct upon the bottom plating of the vessel, without the intervention of the usual bed plates. For the purpose of giving stability to the engines, the cylinders of each set are connected together by straps passing through the dividing longitudinal bulkhead. The engines on the port and starboard side respectively are also tied by girders to the protective deck above. As the *Barham* is intended to realize the high speed of 19½ knots, the engines are specially designed for quick running, the great power to be developed being secured by the exceptional number of revolutions—320 a minute. The boiler power is very great. Steam will be supplied at a pressure of 150 lbs. by six locomotive boilers, three of which are placed forward, and as many aft. Altogether the machinery and boilers will absorb two-thirds of the entire hull. It is expected that the steam trials will take place about Christmas.

THE ELECTRIC LAUNCH "ETA."—On Saturday, September 7th, a small party, consisting of Mr. A. Rawlinson, Mr. Saunders and Mr. Volk, manager for Messrs. Immisch & Co., at their electric launch works, Platt's Eyot, Hampton, started from there to Oxford in the electric launch *Eta*. Maidenhead, the first stopping place, a distance of 26 miles, was accomplished in four hours, without making any allowance for time occupied in passing through the locks, and a re-charge of the accumulators was made during the night at the electric station at that place. On Sunday an excursion was made to Medmenham and back, and the trip was resumed on Monday, when the boat ran to Goring, 34 miles, where the firm has another charging station. Resuming the journey from Goring on Tuesday morning at 10 o'clock, the distance to Oxford, including two halts, was completed by four in the afternoon. There the *Eta* had a rest for two hours, and was visited by a large number of persons, being the first electric launch ever navigated above Goring. Leaving Oxford at 6 p.m., a stop was made at Abingdon for the night, Goring being reached by noon on Wednesday. A small charge was then put in the accumulators, when she proceeded to Reading, and stopped there for the night. On Thursday, at 8 a.m., she left for Maidenhead, arriving there at 1 p.m., after a short stoppage at Henley. It is noteworthy that no loss of time occurred in charging the launch, which was effected during the night, or at meal times, and also that a distance of 60 miles—from Goring to Oxford and back—was accomplished with but one charge of electricity. The *Eta* has, therefore, constituted two records—one for distance and another for work done. Her owners have cause to be satisfied with her performance.

FURTHER ADDITIONS TO THE AMERICAN NAVY.—Besides making provision for the work already in hand, the United States Congress, in its last session, authorised the further expenditure of 4,055,000 dols. for five new vessels, as well as 140,000 dols. for four steam tugs, making a total of £839,000. The principal vessel provided for in the larger vote is "an armoured submerged cruiser," to be named the *Monitor*, and known as the *Thomas* ship, from its designer. The estimated cost is 1,500,000 dols. The vote includes two more steel cruisers of 1,200 tons each, and carrying batteries of quick-firing guns. They will cost 350,000 dols. each. There are also provided for in the latest Act of Congress a harbour ram of 2,000 tons, and a speed of 20 knots, designed by Admiral Ammen, and another dynamite cruiser of the *Fouquier* type. The cruiser is estimated to cost 350,000 dols., the same as her prototype.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES.—ENGLISH.

**Desterro.**—On August 24th Messrs. Hawthorn, Leslie & Co. launched from their shipyard at Hebburn a steel twin screw steamer, built to the order of the National Steam Navigation Co., of Rio de Janeiro, and specially constructed to meet the passenger and cargo requirements of the Brazilian trade. Her dimensions are:—265 ft. by 34 ft. by 19 ft., with twin screw engines, having cylinders of 18 in., 28 in., and 44 in. diameter respectively, with a stroke of 27 in., capable of driving the vessel at a high speed. She is built of steel to the highest class at Lloyd's, and is replete with all the latest improvements for first-class passenger service. Her saloon is on the main deck, in handsome teak house, with promenade deck above and first-class sleeping accommodation below. The sleeping berths are all of the patent fold-up description, and each room is fitted with patent automatic washstands. The second-class accommodation is also in the best style. The vessel is lighted throughout with electric light installation, in addition to the lamp outfit, and electric bell communication is fitted from all rooms to stewards' and servants' quarters. She has also refrigerating machinery of the latest improved type for hot climates, with insulated refrigerating chamber and room. She has Clarke, Chapman & Co.'s patent capstan windlass forward, and their patent double winches at cargo hatches; also warping capstan aft, combined hand and steam steering gear amidships, and Hastie's patent brake aft. Throughout the vessel is designed to ensure the greatest comfort for the passengers. This is the first of two vessels building at Hebburn for the same company, and the second is almost ready to follow. On leaving the ways, Mrs. Arthur Coote, of The Minories, Newcastle, named the steamer *Desterro*.

**Burgermeister Petersen.**—On August 24th this steamer was successfully launched from the Low Walker shipbuilding yard of Messrs. Sir W. G. Armstrong, Mitchell & Co. This latest addition to the petroleum-carrying fleet has a cargo capacity of 3,700 tons, and bunkers arranged for 400 tons of coal. The pumping arrangements are extremely complete—in fact, nothing has been left undone to ensure the highest efficiency in working, and despatch in loading and discharging. The vessel will be lighted throughout by electricity. The owners of the vessel are Messrs. G. J. H. Siemers & Co., Hamburg. The vessel was named by Miss Swan, daughter of Mr. H. F. Swan, director of the company, from whose designs the vessel has been built. Immediately after the launch the vessel was taken to the works of the Wallsend Slipway & Engineering Co., where she will be fitted with triple-expansion engines to indicate 1,600 H.P., with ashpit draught and all the latest modern improvements.

**Avonmore.**—On August 24th Messrs. Joseph L. Thompson & Sons successfully launched from the North Sands Shipbuilding Yard a steel steamer of 3,600 tons deadweight, built to the order of Messrs. Wm. Johnson & Co., of Liverpool. The vessel is of the raised quarter-deck type, and designed for the Danube service of the company. The engines are being built by Messrs. Blair & Co., of Stockton, and are of the triple-expansion type, having cylinders, 28½ in., 39 in., and 64 in., with a stroke of 42 in. The boilers are of steel, multitubular form, having a working pressure of 160 lbs. to the square inch. The deck machinery will consist of four horizontal steam winches, by John Lynn & Co., Pallion; direct steam windlass, by Emerson, Walker & Thompson Brothers; also steam steering gear by Arthur J. Maginnis. As the vessel left the stocks she was named the *Avonmore* by Miss Edith Shaw.

**Foxhound.**—On August 26th a steam yawl, of 145 tons, was launched at Hull, owned by the Humber Steam Trawling Co., Limited, Hull.

**Hanover.**—On August 26th there was launched from the yard of Edwards's Shipbuilding Co., Howdon-on-Tyne, a steel screw steamer, which has been built to the order of Mr. Alex. Meek, Goole, for the Black Sea trade, and specially adapted for carrying grain in bulk. Her dimensions are 265 ft. by 36 ft. by 19 ft. 8 in. moulded, and she is being fitted with triple-expansion engines, having cylinders 20 in., 38 in., and 58 in., by 89 in. stroke, constructed by Messrs. Kincaid & Co., Limited, Greenock, while the boilers are being supplied by Messrs. Joe. T. Eltringham & Co., South Shields. Messrs. Donkin & Nichols's steam steering gear is fitted amidships, and Hastie & Co.'s patent screw gear aft. Four powerful

steam winches by Messrs. Welford Brothers, Sunderland, Harfield's patent windlass, and all the latest and most effective appliances for handling of cargo have been adopted and fitted to the steamer. The steamer was named the *Hanover* by Miss Rosa Meek, daughter of the owner.

**Bluebell.**—On August 27th there was launched from the yard of Messrs. Wm. Pickersgill & Sons, Southwick, Sunderland, a steel clipper barque of the following dimensions:—Length, 195 ft.; breadth, 32 ft.; depth of hold, 19 ft. She is built to the highest class of Lloyd's, and considerably in excess of their requirements. She has been constructed to the order of Messrs. James Tedford & Co., of Belfast, and is the third vessel turned out by the builders for the same owners. She is fitted with steel masts and yards, and the cabin for captain and officers is aft, there being a large iron house on deck for the crew. The patent capstan windlass was supplied by Messrs. Emerson Walker & Thomson Brothers' patent treble-chambered pumps by Messrs. Adair & Co., and two strong hand-power winches by Messrs. R. Roger & Co. The vessel was named the *Bluebell* by Mrs. William Pickersgill.

**Corennie.**—On August 27th, the Blyth Shipbuilding Co. launched from their building yard a screw steamer, built to the order of W. Todd Moffatt, Esq., of Aberdeen. The vessel, which has been constructed of iron to Lloyd's highest class, is 180 ft. long, 27½ ft. broad, and 13 ft. depth of hold, and has straight stem, elliptical stern, and a long raised quarter-deck, bridge, and topgallant forecastle, three holds, and with water ballast in fore and main holds. There is accommodation for captain and officers in the fore end of the bridge and the engineers in the after end, whilst the crew have spacious berths in topgallant forecastle. The vessel has been specially constructed for the herring trade with double tier of beams and a platform deck laid in all the holds, with large hatchways and powerful steam winches by Messrs. Clarke, Chapman, & Co., of Gateshead, for working the cargo, Harfield's steam windlass is placed on forecastle deck and Hastie's gear on bridge, and a powerful screw gear aft by the same makers. The engines are of the triple-expansion type, and are being made by Messrs. Blaikie Brothers, of Aberdeen, and superintended by Mr. Laing, Aberdeen. As the vessel left the ways she was named the *Corennie* by Miss Brewis, of Blytheville, Darlington. The construction of the vessel has been superintended by Mr. A. Main, Aberdeen, and she will be commanded by Captain John Stephens, late of *Craithie* (s), managed by the same firm.

**Parkgate.**—On August 27th a finely-modelled screw steamer was launched from the Whitehall Shipyard by her builders, Messrs. T. Turnbull & Son, of Whitby, the vessel having been built to the order of Messrs. Turnbull & Scott, of London. The naming ceremony was performed by Miss Scott, of London, daughter of Mr. R. T. Scott, one of the managing owners, the vessel being named the *Parkgate*. The following are the dimensions of the vessel:—Length over all, 298 ft. 9 in.; length between perpendiculars, 288 ft.; breadth, 38 ft. 2 in.; depth to top of floor plate, 19 ft. 9 in. Class 100 A1 at Lloyd's. Deadweight capacity about 3,400 tons at 20 ft. 3½ in. She is fitted with Emerson, Walker & Co.'s patent steam windlass.

**Staffa.**—On Tuesday, August 27th, Messrs. Edward Withy & Co. launched from their shipbuilding works at Hartlepool a large steel screw steamer, built to the order of Messrs. Herkind & Woods, of West Hartlepool. She is a large vessel, measuring over 290 ft. in length, constructed throughout of Siemens-Martin steel, and built to the highest class at Lloyd's. She has a long raised quarter-deck, long bridge-house, and a topgallant forecastle. The holds are fitted with iron grain divisions; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after holds the vessel is built on the web-frame system, which gives a very strong type of ship and dispenses with all hod beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and after-water ballast, and the after peak is also available for water ballast. The greater portion of the plates are in 24 ft. lengths making the structure of the ship very strong. Four steam winches, donkey boiler, steam steering gear amidships, Fothergill's reducing valve, screw gear aft, direct steam windlass on forecastle, patent stockless anchors hauling up into hawse pipes, and other modern appliances, are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the passengers, captain, and officers, is handsomely finished in polished hardwood, with neatly painted panels, executed in

a very effective style by the decorative staff of ladies employed by the firm. The vessel will be rigged as a two-masted fore-and-aft schooner with iron pole masts, and all cargo appliances for the expeditious handling of cargo. The engines have been constructed by Messrs. T. Richardson & Sons, of Hartlepool, and are of the triple-expansion type, with two large single-ended boilers. The hull has been constructed under the personal superintendence of Captain Petersen, and the machinery by Mr. Fothergill. On leaving the ways the vessel was gracefully christened *Staffa* by Miss Daisy Herskind.

**Bungaree.**—On August 28th Messrs. Wigham Richardson & Co. launched from the Neptune Works a fine screw steamer, to register 3,400 tons, and to carry over 4,500 tons deadweight. She is built of steel on the three-deck rule, with poop, bridge, and topgallant forecastle, to the order of W. Lund, Esq., of London, and is intended for his Australian Line, for which line the *Riverina*, *Delcomyn*, and *Wilcannia* were also built and engined by Messrs. Wigham Richardson & Co. The vessel is 335 ft. long, 42 ft. beam, and 28 ft. deep, and has accommodation for first-class passengers in the poop. She is fitted with Emerson, Walker & Co.'s patent direct steam windlass, six large steam winches, and all the latest improvements for loading and discharging cargo. The engines, also by Messrs. Wigham Richardson & Co., are of the triple-expansion type (Tweedy's patent), and are intended to indicate 2,000 H.P. The steamer is fitted with Kirkaldy's "compactum" feed water heater, capable of raising the feed water before entering the boilers to a temperature of 230 deg. Fahr.; and with Kirkaldy's "compactum" fresh water distiller, to produce 5,000 gallons of filtered water per day for crew and passengers, and also for cattle use. Captain Mackenzie, of Sunderland, who has superintended the erection of a number of vessels for Mr. Lund's various trades, at the Neptune Works, is also superintending the building and equipment of the ship, and Mr. Andrew Thomson, of London, the engines. As the vessel left the ways she was named the *Bungaree*, by Mrs. Ekins, wife of Captain F. H. Ekins, who will take command.

**Iona.**—On Thursday afternoon, August 29th, there was successfully launched from the yard of Messrs. Robert Thompson & Sons, Southwick, Sunderland, the steel screw steamer *Iona*, built to the order of Messrs. Speeding, Marshall & Co., of the *Iona Steamship Co., Limited*, of this port, and under the superintendence of Mr. J. R. Scott, of Newcastle. The dimensions are:—Length, between perpendiculars, 260 ft.; breadth, 36 ft. 6 in.; depth, moulded, 19 ft. 3 in., and is to the highest class at Lloyd's on the well-deck type, having short poop, long bridge to foremast, topgallant forecastle, cellular double bottom for water ballast, four large hatches, four powerful winches, with large donkey boiler, patent windlass, stockless anchors, steam steering gear, lighthouses on forecastle, and all the most modern improvements. The accommodation for captain and officers is in the poop aft, engineers at the after end of the engine-room, and firemen and crew at the fore end of bridge. She has a cutwater stern, and is schooner-rigged. Her engines are triple-compound, and are supplied by the North Eastern Marine Engineering Co., of Sunderland. On leaving the ways she was gracefully christened by Miss Speeding; and afterwards a large company of ladies and gentlemen made their way to the offices of the builders, where refreshments were provided. It may be of interest to mention that the first ship passed under Victoria Bridge was named the *Iona*, and was built by the late Robert Thompson, father of the senior partner of this firm, for Mr. Speeding's grandfather, Mr. Thomas Speeding, and was the vessel selected to enter first at the opening of the North Dock on November 1st, 1837, and steered by the late Lady Williamson; and we believe that the captain of this vessel, whose name is Rutherford, is still living in Monkwearmouth.

**Haylor.**—On August 29th there was launched from the Middlesbrough yard of Messrs. R. Croggs & Sons, the s.s. *Haylor*, 260 ft. by 35 ft. by 18 ft. 4 in., to carry 2,300 tons on a light draught. She has been built for Messrs. J. Holman & Sons, of London. The engines are by Messrs. Westgarth, English & Co., of Middlesbrough, having cylinders 18½ in., 29 in., 48 in. by 36 in., with two large steam boilers. The vessel and her machinery have been built under the supervision of Captain Holman and Mr. Caiger respectively.

**Chingford.**—On Thursday, August 29th, Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz:—272 ft. length overall, 37 ft. beam, and

18 ft. 11½ in. depth, moulded, built to the order of Messrs. Pyman Bros., London. The vessel takes Lloyd's highest class. She is of the improved well-decked type, having the bridge extra strong, and extending forward to the fore hatch. The poop aft contains a handsome saloon and accommodation for officers and a few passengers; comfortable quarters are provided for the crew in the fore part of the bridge. Emerson, Walker & Co.'s patent windlass is fitted forward. The hull is built with web-frames, giving strong sides, dispensing with hold beams, and permitting the most bulky description of goods to be easily stowed in the holds. A double bottom is fitted under each hold for water ballast. Large hatchways, large donkey boiler, four steam winches, steam and hand steering gear, boats on beams overhead, and all modern appliances will be fitted. The engines are of the triple-expansion type, of 800 H.P., working on three cranks. They are supplied by the Central Marine Engine Works of W. Gray & Co., Limited. The cylinders are 20 in., 31½ in., and 53 in. diameter, and the piston stroke 36 in. The boilers, built of steel, are of large size, and will give an ample supply of steam at a working pressure of 160 lbs. per square inch. The vessel has been superintended during construction by Captain T. Pyman, on behalf of the owners. The christening ceremony was gracefully performed by Miss Dorothy Pyman, of Enfield, London, daughter of the managing owner, the vessel being named *Chingford*.

**Sir Walter Raleigh.**—On August 29th there was launched from Messrs. Craig, Taylor & Co.'s Thornaby Shipyard, Stockton-on-Tees, a handsomely modelled iron screw steamer, of the following dimensions:—Length, 278 ft.; breadth, 37 ft.; depth, 19 ft. 8 in. The vessel has been built with a long raised quarter-deck, bridge extending to, and including foremast and forewinch, short well and topgallant forecastle. She is fitted with web-frames in afterhold, and has double bottom for water ballast in holds and in peaks for about 500 tons. She will be fitted with four steam winches and steam steering gear by Messrs. Robert Roger & Co., of Stockton; patent windlass, by Messrs. Emerson, Walker & Thompson Bros.; light houses; Messrs. Hastie's screw gear aft, and all modern improvements, so as to admit of rapid loading and discharging. The engines, on the triple-expansion three crank system, are being constructed by Mr. Middleton Pratt, of Huddersfield, and are of the following sizes:—Cylinders, 20 in., 33 in., and 54 in. by 36 in. stroke; two large steel boilers, 160 lbs. pressure. The vessel has been built to the order of Christopher Furness, Esq., of West Hartlepool, for Messrs. Triplett & Co., of Plymouth, and as she left the ways she was gracefully christened the *Sir Walter Raleigh* by Mrs. Knight, of Grantham.

**Russia.**—On August 29th Messrs. Laird Brothers launched from their works, at Birkenhead, a fine screw steamer, built to the order of the Hamburg American Steam Packet Co., and intended for their emigrant and cargo service between Hamburg and New York. She was named the *Russia*, and at the request of Mr. Nissen, the president of the company, was christened by Miss Dowie Laird. A large party of ladies and gentlemen witnessed the launch, amongst whom were Mr. Louis Bahr (German Consul); Mr. E. Meyer (Vice-Consul), and lady; Mr. Ellis (of the Bureau Veritas) and lady; Mr. R. W. Leyland and lady; Colonel Cabassa, and officers of the Argentine ironclad *Almirante Brown*. The owners were represented by Mr. E. Ritchard, of Hamburg, superintending engineer; and Mr. John Korte, chief engineer, and Mr. Hoege, of the company's service were also present. The *Russia* is a spar-decked ship with turtle forecastle and turtle poop, and a promenade deck amidships about 125 ft. long. She is entirely of Siemens-Martin mild steel, the scantling in accordance with the Veritas requirements for first division + ½ L.II. class (spardeck rule), and built under special survey. She is fitted throughout with a double bottom on the longitudinal bracket system, divided into 12 watertight compartments, and arranged for water ballast, and has eight watertight bulkheads, extending to main and spar decks. She has a straight stem and elliptic stern, and will be rigged as a schooner with two steel pole masts with yards on the foremast. Her dimensions are:—Length, 273 ft.; beam, 44 ft. 6 in.; depth in hold, 29 ft. 10 in.; with a gross tonnage of about 4,100 tons, and she will carry a large cargo besides coal on 24 ft. draught, and have a speed of 18 knots. The machinery is of the tri-compound direct acting surface condensing type, designed to indicate 3,300 H.P., the crank shaft, piston-rods, connecting-rods, and other parts of steel, and steam is supplied by three double-ended cylindrical steel boilers, each having six furnaces. In deckhouses, under

the promenade deck, there is accommodation for 28 first-class passengers in a handsomely fitted saloon, with state-rooms, pantry, lavatories, &c., captain's room, ladies' cabin and smoking room on the promenade deck, and the officers of the ship are also berthed amidships. The crew's quarters are in the 'tween decks forward, and the two upper 'tween decks are fitted for steerage passengers, of whom about 1,300 will be carried. The arrangements for the latter are very complete, the berths being of iron arranged in blocks, and the spaces thoroughly well ventilated and lighted. The ship will be lighted throughout by electricity, including mast head, side lights, cargo lights, &c. The windlass and warping capstans, by Emerson, Walker & Co., and steering gear, &c., are all worked by steam power, and there are five powerful horizontal steam winches for working the cargo.

**Ulidia.**—On Thursday afternoon, August 29th, Messrs. Richardson, Duck & Co. launched from their building yard a three-masted iron sailing ship of the following dimensions, viz.:—Length, 315 ft.; breadth, 42 ft.; depth of hold, 24 ft. 7 in.; Net tonnage, about 2,385 tons. This vessel, built to the order of Messrs. W. Porter & Sons, Belfast, is classed 100 A 1 in Lloyd's Registry, and has been built under special survey. She has a full poop with accommodation for passengers, captain and officers, a deck-house amidships for crew, petty officers, galley and steam winch, patent direct acting windlass, by Emerson, Walker & Co., and boiler. As the vessel was leaving the ways she was christened *Ulidia*, by Miss Ellie Barkley, of New Orleans. The vessel is being built under the superintendence of Captain Barkley, and will be commanded by Captain Patey, late master of the *Carmonay*, her maiden voyage being from Middlesbro' to Monte Video.

**Treglission.**—On August 31st there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Dock, South Shields, a steel screw steamer of the following dimensions:—Length, 290 ft.; breadth, 39 ft.; depth of hold, 20 ft. The vessel is of the improved well-decked type, and built to class 100 A 1 at Lloyd's, under special survey. Her fittings include shifting boards and other arrangements to comply with the Grain Carriage Act. The machinery, also constructed by Messrs. Readhead & Sons, include triple-expansion engines, having cylinders of 23 in., 37½ in., and 61½ in., with a piston stroke of 39 in., and two steel boilers, working at a pressure of 160 lbs. per square inch. The vessel was named the *Treglission* by Miss Mary Welch, of Leamside. She is the eighteenth vessel built by Messrs. Readhead & Sons, to the order of Messrs. E. Hain & Son, of St. Ives, Cornwall.

**Attivita.**—On September 4th there was launched from the yard of Messrs. C. S. Swan & Hunter a steel screw steamer of the following dimensions:—Length over all, 320 ft.; breadth, 39 ft.; depth, moulded, 25 ft. 3 in. The vessel, which is classed 100 A 1 at Lloyd's, and built under special survey, is on the three-deck grade, and is fitted with full poop for first-class passengers, long bridge-house, and topgallant forecastle; water ballast tanks in a cellular double bottom, all fore and aft, four steam winches, steam steering gear, steam windlass, and extra ventilation to Italian requirements for emigrants, &c. The engines, by the Wallsend Slipway & Engineering Co., Limited, are of the triple-expansion type, fitted with steam starting and reversing gear, Kirkcaldy's feed make-up, &c., and are capable of indicating about 1,450 H.P. This vessel has been built to the order of Messrs. Zino Fratelli, of Savona, for their line between Genoa and South America. As the vessel left the ways she was named *Attivita*, by Mrs. Montaldi, of Forest Hill, near Newcastle.

**Nora.**—On September 9th Messrs. Hepple & Co., of North Shields, launched from their building yard an iron screw steamer, built to the order of Messrs. Lee, Finch & Co., of Cardiff. The dimensions of the new vessel are:—Length, 90 ft.; breadth, 20 ft.; and depth, 10 ft. She will be fitted with powerful triple-expansion engines, which, it is expected, will propel her at the rate of 12 knots an hour. As the steamer left the ways she was named the *Nora*, by Mrs. Nicholl.

**Indiana.**—On Monday afternoon, September 9th, Messrs. Raylton, Dixon & Co. launched from their Cleveland Dockyard, Middlesbro', a fine iron screw steamer, which has been built for Messrs. Bailey & Feltham, of Hull. This vessel's leading dimensions are:—Length over all, 287 ft.; breadth, 38 ft.; depth, moulded, 21 ft. 9 in.; and having a deadweight capacity of about 3,000 tons. She is fitted with raised quarter-deck, having short poop aft, and long bridge amidships, ex-

tending to fore hatch and topgallant forecastle, and otherwise fitted as a first-class cargo steamer. Her engines, which will be supplied by Messrs. Westgarth, English & Co., of Middlesbro', are of 175 N.H.P., with cylinders 21 in., 34 in., 56 in. by 39 in. stroke. On leaving the ways she was christened *Indiana* by Miss Elizabeth Thompson, daughter of the superintending engineer for the owners.

**Tonsberg.**—On Monday afternoon, September 9th, there was launched from the yard of Messrs. Wood, Skinner & Co., Bill Quay, a steel screw steamer, built to the order of Mr. Wilhelm Wilhelmsen, of Tonsberg, Norway. The principal dimensions are:—Length overall, 269 ft.; breadth, 35 ft.; depth, moulded, 18 ft.; with a deadweight carrying capacity of 2,250 tons. She is constructed on the web-frame and cellular bottom principle, and will be registered in the highest class at Lloyd's, and also Norwegian Veritas. The vessel is of the well-deck type, with the cabins in the bridge-house amidships. The upper decks are of iron, and water ballast is fitted in the cellular double bottom throughout the holds. Harfield's patent windlass is fitted forward, Bow, McLachlan's steam steering gear amidships, and Hastie's screw gear aft. The engines have been built to Lloyd's and Norwegian Veritas requirements by the North Eastern Marine Engineering Co., Limited, Wallsend. They are on the triple-expansion system, of 750 I.H.P., and are capable of propelling the vessel at a speed of ten knots loaded. As the vessel left the ways she was named the *Tonsberg*, the christening ceremony being gracefully performed by Miss Conradi, daughter of Mr. T. M. Conradi, Norwegian Consul of Newcastle-on-Tyne. This is the fourth vessel launched this year by Messrs. Wood, Skinner and Co. for Norwegian account. The firm have another large vessel to put down in the place of the *Tonsberg*.

**Lillian.**—On September 9th there was launched from the yard of Messrs. R. Irvine & Co., West Hartlepool, the a.s. *Lillian*, built to the order of Messrs. J. S. Allison & Co., of West Hartlepool. The dimensions of the vessel are:—231 ft. 6 in. by 32 ft. by 16 ft. 2 in. moulded. The engines are by Messrs. Westgarth, English & Co., Middlesbro', and will indicate about 600 H.P. The cylinders are 16½ in., 26 in., 44 in., by 38 in., with one large steam boiler, 160 lbs. working pressure.

**Rondo.**—On September 9th there was launched from the shipbuilding yard of Messrs. T. & W. Smith, North Shields, a screw steamer of the following dimensions:—Length, 225 ft.; breadth, 32 ft. 6 in.; depth of hold, 15 ft. 9 in. The vessel will be fitted with engines of the triple-expansion type, with cylinders 16½ in., 27 in., and 44 in., and length of stroke 33 in., the boiler working at a pressure of 160 lbs. per square inch. The vessel will be engined by Messrs. J. P. Rennoldson & Sons, South Shields, and the boilers supplied by Mr. J. T. Eltringham, of the same town. She will be fitted with all the latest improvements for rapid loading and discharging of cargo, including four large steam winches by Clarke, Chapman, & Co., Gateshead. She will also be fitted with Harfield & Co.'s chain gear and windlass, and Donkin & Nichol's steam-steering gear. As the vessel left the ways, she was named the *Rondo* by Miss Laura Reay, daughter of Mr. Joseph Reay, of the firm of Messrs. R. B. Fenwick & Reay, Newcastle, to whose order the vessel has been built. This is the third vessel built by Messrs. Smith for the same firm.

**Apache.**—On Tuesday, September 10th, Messrs. Raylton, Dixon & Co. launched from their No. 2 Dockyard, Middlesbro', a fine steel screw steamer, which has been built for Liverpool account. The leading dimensions of this vessel are:—Length over all, 305 ft. 3 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in., with a deadweight carrying capacity of over 3,600 tons. She is built with raised quarter-deck, and has long bridge, extending to beyond foremast, and connected to forecastle, thus forming "partial awning deck" steamer. Her engines, which are being supplied by Messrs. T. Richardson & Sons, of Hartlepool, are of 190 N.H.P., with cylinders 22 in., 35 in., 59 in., by 39 in. stroke. On leaving the ways she was christened *Apache* by Miss Dolly Glen, of Greenock.

**Marmion.**—On Wednesday, September 11th, Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—272 ft. length over all; 37 ft. beam; and 18 ft. 11½ in. depth, moulded, built to the order of Messrs. George Pyman & Co., West Hartlepool. The vessel takes Lloyd's highest class. She is of the improved well-decked type, having the bridge extra strong, and extending forward to the fore hatch. The poop aft contains a handsome

saloon and accommodation for officers and a few passengers. Comfortable quarters are provided for the crew in the fore part of the bridge. Emerson, Walker & Co.'s patent windlass is fitted forward. The hull is built with web frames, giving strong sides, dispensing with hold beams, and permitting the most bulky description of goods to be easily stowed in the holds. A double bottom is fitted under each hold for water ballast. Large hatchways, large donkey boiler, four steam winches, steam and hand steering gear, boats on beams overhead, and all modern appliances will be fitted. The engines are of the triple-expansion type, of 800 H.P., working on three cranks. They are supplied by the Central Marine Engine Works of W. Gray & Co., Limited. The cylinders are 20 in., 31½ in. and 53 in. diameter, and the piston stroke 36 in. The boilers, built of steel, are of large size, and will give an ample supply of steam at a working pressure of 160 lbs. per square inch. The vessel has been superintended during construction by Captain T. Pyman, on behalf of the owners. The christening ceremony was gracefully performed by Miss May Pyman, of Castle Eden, the vessel being named *Marmion*. She is a sister ship to the s.s. *Chingford*, recently launched by the same builders for Messrs. Pyman Brothers, London.

**Hercules.**—On September 11th Messrs. Vosper & Co., of Broad Street, Portsmouth, launched at their works a steel steam tug, which they have built for the Shoreham Harbour Trustees. Her length between perpendiculars is 75 ft.; beam, 17 ft.; depth amidships, 8 ft. 6 in. She is classed 100 A 1 by Lloyd's, and is passed to carry passengers by the Board of Trade. The launch took place in the presence of Dr. Fuller, the Chairman of the Shoreham Harbour Trustees; Mr. Thomas Hardy, their Secretary; and several lady friends of the builders' firm. The christening ceremony was performed most ably and gracefully by Miss Fuller, the *Hercules* starting down the ways immediately the bottle of wine was dashed against her side, amidst the hearty cheers of the workmen, and not the least hitch occurred to mar the event. Especial interest was shown in the launch, as it was the first steel vessel built by a private firm in Portsmouth. We understand that Messrs. Vosper & Co. have received an order to build a much larger vessel, which they will lay down at once.

**Wansbeck.**—On September 11th there was launched from the Howdon Yard of Palmer's Shipbuilding & Iron Co. a finely modelled cargo steamer of the following dimensions:—Length between perpendiculars, 261 ft.; breadth, moulded, 37 ft.; depth, 19 ft. The vessel will be rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. She is of the well-decked type, with the bridge extended to the foremast. The upper decks are of iron. The captain's and officers' accommodation is provided in a sunk poop aft, the engineers' accommodation is at the other end of the bridge, and the crew at the fore end. Water ballast is provided for in a double cellular bottom extending fore and aft. The ship is fitted with Clarke, Chapman & Co.'s direct steam windlass, steam steering gear amidships, and Hastie's screw gear aft. The vessel will load over 2,500 tons deadweight on a moderate draught. On leaving the ways she was named the *Wansbeck* by Mrs. Hill, wife of the manager of the Jarrow shipyard. The vessel has been built to the order of Messrs. Bowser, Ormston & Co., of Newcastle.

**Ackworth.**—On September 11th Messrs. Ropner & Son launched from their yard at Stockton a steel screw steamer for Messrs. Joseph Merryweather & Co., of West Hartlepool, of the following dimensions:—Length over all, 282 ft. 6 in.; breadth, 38.10 ft.; depth, moulded, 21.11 ft. She will be classed 100 A 1 at Lloyd's, and carry 3,300 tons. She has a short poop, in which is fitted accommodation for captain and officers, raised quarter-deck, long bridge (extending to foremast), short well, and topgallant fore-castle, with cellular bottom for water ballast. She is built on the web-frame principle, and will have all the latest improvements to make her a first-class cargo steamer, including Emerson, Walker & Co.'s patent steam windlass. She will have triple-expansion engines by Messrs. Blair & Co., Limited, of 900 I.H.P., with two large steel boilers, working at 160 lbs. As she left the ways she was named *Ackworth* by Miss Marritt, of Welbury Rectory.

**Blackheath.**—On Thursday, September 12th, Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz:—Length, 310 ft.; breadth, 41 ft. 6 in.; depth, 23 ft. ¼ in., built to the order of Messrs. Watts, Ward & Co., London, and classed 100 A 1 at Lloyd's. The vessel is of

the well-decked type, with poop, containing saloon and cabins for officers and a few passengers; long raised quarter-deck; long bridge of extra strength right up to fore hatch, and containing crew's quarters at fore end, and engineers' berths aft; open top-gallant fore-castle with Emerson, Walker & Co.'s direct steam capstan windlass. The hull is built on the web-frame principle, dispensing with hold beams, and giving a clear hold for stowing bulky cargo. Large hatches are fitted, four steam winches, steam steering gear amidships, screw gear aft, two donkey boilers, and cellular double bottom throughout for water ballast. The rig will be schooner with double foretop sails and topgallant sail. The boats will be carried overhead on beams, and a full equipment of modern appliances provided for general trading. The engines are on the three-cylinder triple-expansion principle. The hull and machinery are being superintended by Captain J. A. Hodgson and Mr. A. H. Alchin, respectively, on behalf of the owners. The christening ceremony was gracefully performed by Mrs. Alfred Emly, of Ellison Place, Newcastle-on-Tyne, the vessel being named the *Blackheath*.

**Rudesheimer.**—On September 12th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, the sixth steamer built by that firm for the Hansa Steamship Co., of Bremen. The length of the vessel is 323 ft.; breadth, 41 ft.; and depth of hold, 27 ft. 6 in. The steamer is built to the spar-deck rule and has large topgallant fore-castle to accommodate crew and firemen, and long bridge amidships in which is placed the saloon and accommodation for captain, officers, and a few first-class passengers. The vessel is constructed upon the web-frame principle, thus dispensing with hold beams and has cellular water ballast all fore aft; all weather decks are of wood and all frames of Z steel. Her class will be 100 A 1 Lloyd's special survey, and also the highest class in the German Registry. The deck machinery consists of five large steam winches by Clarke, Chapman & Co. Harrison's steam steering gear, which is placed in the engine-room and worked from the bridge. Harfield's patent direct steam windlass, Tyzack's patent anchors, and all the usual appliances for handling cargo and working the ship with the greatest possible despatch. The main engines are upon the tri-compound principle, by the North Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 23½ in., 39 in., and 64 in. by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel during construction has been inspected on behalf of the owners by Mr. Wulff and Mr. Himer, and upon leaving the ways was gracefully named *Rudesheimer*, by Miss Swainston, after which she was towed into the South Dock to receive her machinery.

**Rob Roy.**—On September 12th Messrs. Cochrane, Cooper, & Schofield launched from their shipyard, at Grovehill, Beverley, a steam trawler and carrier, which is the fifth vessel they have built to the order of Messrs. Pickering & Haldane, of Hull. The trawler, which is classed 100 A 1 at Lloyd's, is 105 ft. long, 20 ft. 3 in. beam, and 11 ft. in depth. It will be fitted with powerful engines by Messrs. C. D. Holmes & Co., of Hull. Miss Brown, niece of Mr. Pickering, named the vessel the *Rob Roy*.

**Incharran.**—On September 12th there was launched from the yard of the Palmer Iron & Shipbuilding Co., Jarrow, a screw steamer of the following dimensions:—Length, between perpendiculars, 320 ft.; breadth, 42 ft.; depth, 29 ft. The vessel will be rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. On leaving the ways she was named *Incharran* by Mrs. Hall, wife of the engine-works manager (Mr. J. P. Hall). The vessel has been built to the order of the Inch Line, managed by Messrs. Hamilton, Fraser & Co., Liverpool, under the personal superintendence of Mr. Edminston. She is designed to load over 4,600 tons deadweight.

**Lynton.**—On September 14th Messrs. John Blumer & Co. launched from their yard at North Dock, Sunderland, a steel screw steamer, built to the order of Messrs. John Holman & Sons, London, of the following dimensions:—Length, 240 ft.; breadth, 36 ft.; depth, 19 ft. 5½ in., having a long raised quarter-deck, long bridge to foremast, short well, and topgallant fore-castle; four steam winches by Messrs. Rogers, Stockton; steam steering gear by Messrs. Davis, London; after-gear by Mr. John Hastie, Greenock; windlass by Messrs. Emerson, Walker & Co.; and all the latest improvements for quick despatch of cargo. The engines and boilers are built by Messrs. Alley & Maclellan, Glasgow, cylinders 18 in., 30 in., 48 in., and 36 in.

stroke; two boilers of steel, 160 lbs. per square inch. On leaving the ways the vessel was named *Lynton* by Miss Hilda Pinkney, of Sunderland.

**Barmen.**—On September 23rd Messrs. Sir W. G. Armstrong, Mitchell & Co. launched from their Low Walker Shipbuilding Yard the steel screw steamer *Barmen*, being the second vessel built to the order of the German Australian Steamship Co., of Hamburg, for their new service between Hamburg and Australia direct. The vessel is of 3,500 tons burthen, built to the highest class at Lloyd's and Veritas, and has long full poop extending to midships for the accommodation of emigrants. After the launch the *Barmen* proceeded to the works of the Wallsend Slipway & Engineering Co. to receive her machinery, which will be of the triple-expansion description, with boilers working at 160 lbs. pressure, and fitted with all the most recent appliances, including assisted draught. The machinery will be capable of indicating about 1,400 H.P. The vessel will be fitted throughout with electric light, and, generally speaking, finished in a most complete manner for her intended service.

**Victor.**—On September 25th there was launched from the shipbuilding yard of Messrs. Schlesinger, Davis & Co., Wallsend, a steel screw steamer, built to the order of Messrs. John Pile & Co., London. Her principal dimensions are as follows:—Length, between perpendiculars, 138 ft.; breadth, moulded, 22 ft. 8 in.; depth, moulded, 11 ft. 6 in. She has a short raised quarter-deck, short bridge, and topgallant forecastle. The vessel has been built to the highest class at Lloyd's. Accommodation for the captain and officers has been provided under the raised quarter-deck aft. The forecastle is fitted up in a neat and substantial manner for the crew. The vessel will be rigged as a fore-and-aft schooner, and will be fitted with triple-expansion engines and steel boiler by Messrs. Hanna, Donald & Wilson, Abbey Works, Paisley.

#### LAUNCHES.—SCOTCH.

**Hain Yu.**—On August 23rd Messrs. Napier, Shanks, and Bell launched from their shipbuilding yard at Yorker, the *Hain Yu*, a two-decked steel screw steamer of 1,350 tons gross, which they have constructed to the order of the China Merchant Steam Navigation Co., of Shanghai, for their river and coast service in China. The vessel has been specially designed with the view of having a large carrying capacity on a light draught, and although intended principally for the cargo trade she has been provided, in deck houses, with superior accommodation for a limited number of passengers. Her dimensions are:—Length, 250 ft.; breadth, 36 ft.; and depth, 20 ft. 8 in.

**Margaret.**—On August 24th, there was launched from the yard of Messrs. John Fullerton & Co., Merksworth, Paisley, an iron screw steamer, named the *Margaret*, of about 250 tons, built to the order of Messrs. Pattinsons & Winter, corn millers, Whitehaven, for their own carrying trade. She will be fitted with compound engines of 50 N.H.P. by Messrs. Ross & Duncan, Govan.

**St. Kilda.**—On August 27th there was launched from the shipbuilding yard of Messrs. Scott & Co., Greenock, a steel screw steamer, which has been built to the order of Mr. Robert Harper, Glasgow, and intended for his general coasting trade. The dimensions are:—175 ft. by 26 ft. 6 in. by 13 ft.; and the engines will be supplied by Messrs. King & Co., Kingston Engine Works. On leaving the ways the steamer was named *St. Kilda* by Miss Harper.

**Tabor.**—On August 27th Messrs. Aitken & Mansel launched from their yard at Whiteinch a handsome steel screw vessel, of about 2,500 tons register, for Messrs. James Moss & Co., Liverpool. Dimensions:—320 ft. by 39 ft. by 22 ft., with accommodation for about 80 passengers. The machinery, of the triple-expansion type, will be fitted by Messrs. David Rowan & Son, Glasgow, and the construction of the vessel throughout has been under the supervision of Messrs. Wm. Esplen & Son, Liverpool. The vessel was named the *Tabor* by Miss Hewitt, of Wexford, and is to be employed in the company's Egyptian line of steamers between Liverpool and Alexandria.

**Palestine.**—On August 27th a wood steam schooner was launched at Peterhead, owned by Messrs. W. Walker & Co., Aberdeen.

**Rannoch.**—On August 27th there was launched from the shipbuilding yard of Messrs. Murdoch & Murray a large steel screw steamer of the following dimensions:—Length, 260 ft.;

breadth, 37 ft.; depth, 23 ft. 9 in.; and a deadweight capacity of 2,300 tons. This vessel has been built to the order of Messrs. James Gardiner & Co., Glasgow, for a general cargo trade, and is fitted with all the latest appliances for the rapid loading and discharging of cargo. She is specially fitted up for carrying grain, and has a double bottom throughout for water ballast on the cellular principle. During construction the vessel has been under the personal supervision of Captain Gibb, and is classed 100 A 1 at Lloyd's. On leaving the ways she was named the *Rannoch*, and was taken to Glasgow to have her machinery fitted on board by Messrs. David Rowan & Son.

**Aravatta.**—On August 28th Messrs. Wm. Denny & Bros., Dumbarton, launched a steel screw steamer, of about 2,170 tons gross measurement, for the Australasian United Steam Navigation Co., Limited. She will be handsomely fitted up for a large number of first and second class passengers. The engines will be triple-expansion, by Denny & Co., Dumbarton. She was named the *Aravatta* by Miss Jane Leresche, daughter of the secretary of the company.

**The Bee.**—On August 28th there was launched from the shipyard of Messrs. David Macgill & Co., Irvine, the hull of a steam trawler measuring 100 ft. between perpendiculars, 20 ft. 6 in. beam, and 11 ft. hold. As the vessel slipped down the ways she was named *The Bee* by Mrs. David Macgill. She is intended for deep sea trawling. The owners are Messrs. Knowles & Robie, Hull. The engines are to be supplied by Messrs. Muir & Houston, Glasgow.

**Godolphin.**—On August 29th there was launched from the Killybank shipyard, Alloa, the largest steel steamship yet built at Alloa by the Grangemouth Shipyard Co. The vessel as she left the ways was christened the *Godolphin* by Miss Moir, daughter of Mr. Archibald Moir, Marshall. The owners of the new vessel are Messrs. the Lamplugh Co., London, and will be classed A 1 at Lloyd's, and has been built under special survey. Her length between the perpendiculars is 250 ft.; breadth, moulded, 35 ft.; depth, moulded, 19½ ft.; the registered tonnage, 2,800 tons. The engines will be supplied by Messrs. Hutson & Corbett, Kelvinhaugh Engine Works, Glasgow.

**Salerno.**—On August 29th the *Salerno*, a screw steamer of about 2,100 tons, and built to the highest class in Lloyd's, was launched by Messrs. Alex. Stephen & Sons, Linthouse. She has been built to the order of Messrs. Robert M. Sloman & Co., Hamburg, and specially designed and fitted for their trade between New York and Rio de Janeiro. The *Salerno* has triple-expansion engines with cylinders 21 in., 33 in. and 54 in. diameter by 42 in. stroke. She is a sister ship to the *Capua*, recently launched at Linthouse, and is the seventeenth vessel constructed there for the same owners. The ceremony of naming the ship was gracefully performed by Miss Jacobina Kemp, Overbridge, Ibrox.

**Karlsruhe.**—On August 31st the Fairfield Shipbuilding and Engineering Co., Limited, launched from their yard at Govan, the steel screw steamer *Karlsruhe*, of 5,200 tons, for the Nord-deutscher Lloyd of Bremen. Her principal dimensions are:—Length over all, 430 ft. 10 in.; breadth, 48 ft., moulded; depth, 33 ft., moulded. The *Karlsruhe* has been constructed in accordance with the newest regulations of the Germanischer Lloyd, under their special survey, and will be classed in the highest grade of that society. She also conforms in every respect to the Board of Trade regulations, and to the latest requirements of the United States. She is built throughout of the best Siemens-Martin steel, and has three decks, all fore and aft, poop, bridge, and topgallant forecastle. The weather and upper decks are of teak, and the deck-houses are of steel and teak. The vessel will have accommodation for about 42 first-class, 36 second-class, and 2,102 third-class passengers, besides ample accommodation for the officers and crew. The first-class passengers are accommodated forward under the promenade deck in a large deck-house, which also includes engineers', doctor's, and steward's rooms, hospitals, galleys, lavatories, &c. The first-class state-rooms are situated aft of a commodious and most tastefully decorated saloon, and on the promenade deck are the first-class smoking-room and ladies' saloon, and also accommodation for captain, pilot, and officers. The second-class passengers are accommodated under the poop, aft of a spacious saloon, and on the poop deck is the second-class smoking-room. All the cabins and saloons are fitted up with the most modern appliances for comfort. The main and lower 'tween decks are fitted up for third-class passengers, thorough ventilation being specially provided for. As

these decks are also arranged for hammocks, the ship could be used for carrying a large number of troops. When not carrying passengers these spaces will be utilised for cargo. The *Karlruhe* is lighted throughout by electricity, for which purpose she has three distinct engines and dynamos, each furnishing power for about 365 incandescent lights, and provision against fire has been made by suitable sub-division of the ship, and by the use of steam injectors and independent water service from powerful hand and steam pumps. The *Karlruhe* is schooner-rigged, having two pole masts of steel, with yards on the foremast, and will carry ten large lifeboats, besides six of Chambers Brothers' improved patent partly-collapsible lifeboats. She will be fitted with steam capstan, windlass, warping capstan, steam winches, and all the latest improvements for the working of cargo. Her engines are of the inverted triple-expansion type, with cylinders of 31 in., 52 in., and 83 in. diameter, the stroke of piston being 4 ft. 6 in. The crank shaft is built, and, like the propeller shaft, is made of Vickers, Sons & Co.'s steel; the tunnel shafts are of Siemens-Martin steel, and were supplied by Messrs. John Brown & Co., Sheffield. The engines are fitted with all the latest improvements for economising fuel, including feed water heater, a fresh water producer for the boilers, &c. The propeller boss and blades are of cast steel. Steam is supplied from two double-ended boilers and two single-ended boilers, all made of steel plates throughout. The furnaces, 18 in number, are also of steel, and corrugated. The boilers have been constructed in accordance with the British Board of Trade and Germanischer Lloyd rules for a working pressure of 150 lbs. per square inch. The machinery is similar in every respect to that fitted by the same firm to the *Dresden* and *Munich* some months ago, ships which have proved to be the most economical in the company's fleet. The christening ceremony was performed by Mrs. Heineke, wife of Captain Heineke, the company's superintendent.

**Sophie Rickmers.**—On September 2nd Messrs. Russell & Co., shipbuilders, Greenock, launched a finely-modelled large spar-decked steel screw steamer for Mr. Rickmers, of Bremerhaven. Her dimensions are:—Length, 330 ft.; breadth, 42 ft. 6 in.; and depth, moulded, 28 ft. 10 in.; of 3,200 tons gross, with a deadweight capacity of 4,250 tons. She is classed 100 A 1 at Lloyd's and in the French Veritas, and will be supplied with all appliances of the most improved description. Her triple-expansion engines, of 1,800 I.H.P., will be furnished by Messrs. Dunsmuir and Jackson, engineers, Glasgow. After being fitted out for sea, the vessel will be employed in the rice-carrying trade between Rangoon and Bremerhaven. On leaving the ways the new steamer was named *Sophie Rickmers* by Mrs. M'Dougall, wife of Mr. D. M'Dougall, manager of the Greenock Steamship Co.

**Ifafa.**—On September 7th this vessel, built to the order of Messrs. J. T. Rennie, Son & Co., of London and Aberdeen, was launched from the yard of Messrs. Hall, Russell & Co., Aberdeen. Her dimensions are as follows:—Length, 270 ft. 4 in.; breadth, 35 ft. 2 in.; and depth, 23 ft. 6 in. She is built on the spar deck rule, and will be fitted with triple-expansion engines also of Messrs. Hall & Russell's manufacture, with cylinders 21 in., 34 in. and 56 in. by 42 in. stroke. She will also be fitted throughout with electric light. This vessel is the third of the same design built for Messrs. Rennie under the superintendence of Messrs. Flannery, Balgallay & Johnson, of London and Liverpool, and is sister to the *Matabele*, whose engines made the longest run on record without stopping, namely, over 6,000 miles.

**Holyrood.**—On September 10th there was launched from the shipbuilding yard of Messrs. Robert Duncan & Co., Port-Glasgow, a steel screw steamer, which has been built to the order of Messrs. Raeburn & Vernel, of Glasgow, and is intended for their general cargo trade. Her dimensions are as follows:—Length, 300 ft.; breadth, 40 ft.; depth of hold, 25 ft. She is built on the three-deck rule, and is to carry 4,100 tons all told on Lloyd's freeboard. The engines, which are being built by Messrs. Rankin & Blackmore, of Greenock, are of the quadruple-expansion type, the N.H.P. being 167; diameter of cylinders 18 in., 26 in., 36 in., and 52 in. by 39 in. stroke. As the steamer was leaving the stocks she was named the *Holyrood*, the ceremony being performed by Mrs. Raeburn. The *Holyrood* is commanded by Captain Rettie, late of the *Borghese* (s).

**Cairniehill.**—On September 10th Messrs. Russell & Co. launched from their Kingston Yard, Port-Glasgow, a four-masted steel sailing barque of 2,600 tons net register, to carry 4,200 tons cargo. Her dimensions are:—Length, 313 ft.;

breadth, 42 ft.; depth hold, 24 ft. 6 in. This vessel is built to the order of Messrs. W. T. Dickson & Sons, Liverpool, and is a sister ship to the *Glencaird*, built some months ago by Messrs. Russell & Co., for the same owners. The vessel is built to Lloyd's highest requirements, and was superintended during construction by Captain English, who will command her. On leaving the ways she was named *Cairniehill*, and after the launch was towed to the James Watt Dock to fit out. Messrs. Russell and Co. will put down the keel of a large ship of similar dimensions on the vacated ways.

**Barraclough.**—On September 12th Messrs. Ramage & Ferguson launched at Leith a steel screw steamer, built to the order of T. Barraclough, Esq., for the West Hartlepool Steam Navigation Co. Her dimensions are:—Length, 260 ft.; breadth, 37 ft.; depth of hold, 19 ft. 5 in. She is 1,680 tons gross register, and is fitted with double bottom fore and aft, peak tanks, steam steering gear, winches, and patent windlass. The vessel will be fitted by the builders with boilers and triple-expansion engines 900 I.H.P., and will be schooner-rigged fore and aft. Mrs. Ernest Webster, of Wolviston Hall, Stockton-on-Tees named the vessel the *Barraclough*. It may be mentioned that the *Barraclough* is a duplicate of the steamer *Maristow*, launched by the same firm nine months ago.

**Salto.**—On September 12th the Ailsa Shipbuilding Co., launched from their yard at Troon, a finely-moulded saloon paddle steamer for the River Plate trade. The dimensions are:—Length between perpendiculars, 150 ft.; breadth, moulded, 21 ft.; and depth, moulded, 7 ft. She has been built to the order of Captain Climaco Becker, of Montevideo, under whose personal supervision she has been constructed. She is entirely built of mild steel, and is supplied with steam windlass, and all the most approved fittings and arrangements for trading in a hot country in shallow waters. The engines, which are horizontal compound surface-condensing, with cylinders 20 in. and 39 in. diameter, and 48 in. stroke, are being constructed by Messrs. David Rowan & Son, Glasgow. On leaving the ways she was named the *Salto* by Miss Wallace, Ballantyne Drive, Ayr.

**Guide.**—On September 12th there was launched by Messrs. W. B. Thompson & Co., Dundee, an iron twin-screw steamer, to the order of the Indian Government. She is the first vessel at this port at which the religious service prescribed by the Admiralty has been carried out at the launch. This vessel has been built for the special requirements of the Indian Marine, in order to meet the necessities of the anchoring and mooring arrangements in India. She is 215 ft. long, 30 ft. beam, with a depth of hold of 15 ft. 3 in., and is fitted with triple-expansion engines intended to maintain a speed of 15 knots on a mean draught of 12 ft. fully laden. This speed is required by the Government in India to fulfil the purposes of the specially designed arrangements fitted on board the ship, and to overcome the heavy current which runs in the vicinity in which the vessel will be employed. The detail arrangements have been supervised by Sir Edward Reed. Messrs. Thompson & Co. undertook to construct the *Guide* at a time when close competition controlled the market, and they have turned out the boat in a most substantial manner, the officials who superintended her construction expressing themselves highly pleased with the way in which the contract has been carried out.

**Burrawong.**—On September 12th the finely-modelled twin screw steamer *Burrawong* was successfully launched from the yard of Messrs. Gourlay Brothers & Co., Dundee, with engines, masts, sails, &c., fitted, and steam up, fully equipped and ready for sea. The *Burrawong* has been built to the order of Mr. John See, M.P., of Sydney, specially for passenger coasting and river traffic in Australian waters. Her principal dimensions are:—Length, 155 ft.; breadth, 28 ft. 1 in.; depth, 9 ft. 2 in., and she is classed at Lloyd's as a steel ship. She is of 391 tons gross register, and has been fitted by the builders with two sets of triple-expansion condensing engines on the three-crank principle, which are capable of developing an indicated power of 600 horses. The boiler is of steel, with three patent ribbed furnaces, and will work at a pressure of 160 lbs. per square inch. Water ballast tanks have been fitted in the fore-and-aft peaks. There is accommodation for about 45 first-class passengers in the poop, and for 20 second-class forward, officers rooms being fitted amidships under the bridge deck. As the vessel glided into the water the christening ceremony was performed by Miss Barbara Barrie, daughter of Captain Charles Barrie. The *Burrawong* is the largest steamer ever launched

at Dundee with all her machinery on board, steam up, and ready for sea.

**Dalhousie.**—On September 13th Messrs. William Denny & Brothers, Dumbarton, launched the steel-built twin-screw tug *Dalhousie*. Builders' dimensions, 215 ft. by 32 ft. by 16 ft. 6 in., gross tonnage, about 700. She will be fitted by Denny & Co. with two pairs compound engines of 2,200 H.P. This tug is for the Clive Steam Tug Co.'s service on the Hooghly, the largely increased tonnage of sailing ships making the unusually great power in this steamer necessary. The *Dalhousie* was named by Miss Walker, Viewforth, Edinborough, daughter of the superintending engineer of the company.

**Grace Harwar.**—On September 14th there was launched from the shipbuilding yard of Messrs. William Hamilton & Co., at Port-Glasgow, a handsomely-modelled three-masted sailing ship named the *Grace Harwar*, net register tonnage 1,730 tons, and to carry 2,970 tons. This vessel has been built to the highest class at Lloyd's, and of Siemens' steel through-out; has been fitted with Mill's patent pumps, and all the latest improvements for the speedy loading and discharging of cargo. She has been built to the order of Messrs. William Montgomery & Co., of London, and will be commanded by Captain J. D. Watt. The vessel, after being fitted out, will load a general cargo at London for San Francisco. During her construction she has been superintended on the owners, behalf by Captain W. A. Flinn, of Liverpool. On leaving the ways the ceremony of naming the vessel was performed by Mrs. Montgomery, and the act of launching by Mrs. John Hayton, of Liverpool.

**Hawthornbank.**—On September 14th Messrs. Russell & Co. launched from their Bay-street yard, Port-Glasgow, a three-masted steel sailing barque named *Hawthornbank*, of 1,320 tons net register, to carry 2,260 tons deadweight on Lloyd's free-board. Her dimensions are:—Length, 320 ft.; breadth, 36 ft.; depth, 21 ft. 6 in. During construction the vessel, which is built to Lloyd's highest requirements, was superintended by Captain Erskine, the company's superintendent. This vessel is supplied with all the most approved appliances to adapt her for a general trade, and is built to the order of Messrs. Andrew Weir & Co., Glasgow. After the launch she was berthed at the cranes in the East Harbour, Port-Glasgow, where she will complete her outfit.

**James Hunter.**—On September 14th Messrs. A. Hall & Co., of Aberdeen, launched a steel screw steamer of 220 tons gross tonnage. The steamer has been built to the order of the Northern Co-operative Co., Limited, Aberdeen, and is to be engaged in the rapidly developing coal trade of the company. Out of compliment to the chairman of the company, the vessel was named the *James Hunter*.

**Peter Rickmers.**—On September 17th Messrs. Russell & Co. launched from their Kingston Shipbuilding Yard, Port-Glasgow, a large steel sailing ship of the following dimensions:—Length, 331 ft.; breadth, 44 ft. 6 in.; and depth, 25 ft. 6 in., her dead-weight carrying capacity being 4,500 tons. She was named the *Peter Rickmers*, and was built to the order of Mr. R. C. Rickmers, Bremerhaven, for whom Messrs. Russell & Co. have built several vessels. After being launched the vessel was towed to the James Watt Dock, Greenock, where she will be fitted up and load. The *Peter Rickmers'* construction was superintended by Captain Generrick.

**Kelburn.**—On September 23rd Messrs. Barclay, Curle & Co. Limited, launched from their shipbuilding yard at Whiteinch the *Kelburn*, a four-masted sailing ship of 2,500 tons register, built to the order of Messrs. Shankland & Co., Greenock, and intended for their general trade. The vessel is classed 100 A 1 at Lloyd's, and has a full East Indiaman outfit. Her dimensions are:—Length, 295 ft.; breadth, 43 ft. 6 in.; depth, 27 ft. She was named, as she left the ways, by Miss Isa Shankland, niece of the owner.

**Mangara.**—On September 24th Messrs. Alex. Stephens & Sons launched at Linthouse the fifth steamer built by them for Messrs. Maclay & McIntyre, and the vessel as she entered the water was named the *Mangara* by Mrs. Maclay. The *Mangara* is a steamer of about 1,900 tons gross register, and highest class in Lloyd's. The captain's and officers' rooms are in a short full poop, the engineers are accommodated in a house on bridge, and the firemen and seamen in a topgallant fore-castle. The vessel is on the improved well-deck type, with long bridge—ing in the fore and main masts, and has been constructed with heavy side frames and side intercostal keelsons, dispensing

with hold beams, thus leaving large unobstructed holds for the stowage of cargo of the bulkiest description. She has a double bottom on the cellular principle for water ballast, has four long hatchways, and is fitted with grain boards in conformity with Board of Trade requirements for carriage of grain in bulk. She is schooner-rigged with steel pole masts, and is fitted with steam winches, steam windlass, steam steering gear, and all modern appliances for the efficient handling of ship and cargo. The engines are of the most improved triple-expansion type, having cylinders 18 in., 29 in., and 46 in. diameter by 39 in. stroke, with steel boiler suitable for a working pressure of 160 lbs.

#### LAUNCHES—IRISH.

**Creek Fisher.**—On August 9th there was launched from the shipbuilding yard of Mr. Paul Rodgers, Carrickfergus, a steel three-masted schooner, built to the order of Messrs. James Fisher & Sons, Barrow-in-Furness, and will class 100 A 1 at Lloyd's. Her dimensions are:—Length, 105 ft.; breadth, 22 ft. 6 in., and depth, 9 ft. 9 in. She is a very handsome model, and should sustain the builder's reputation, both in sailing and carrying qualities. The ceremony of christening was performed by Miss Nettie Lynn, who named the vessel the *Creek Fisher*, as she moved off the ways. Captain Henry Watkinson was present at the launch, representing the owners, and this gentleman will superintend the fitting out of the vessel. Mr. Rodgers has built quite a fleet of vessels for Messrs. Fisher, all of which have given the utmost satisfaction. At the present time he has an order from them to build another vessel similar in dimensions to the *Creek Fisher*.

**Ameer.**—On August 24th there was launched by Messrs. Harland & Wolff, Belfast, a large screw steamer named the *Ameer*, built to the order of Messrs. Thomas & John Brocklebank, of Liverpool, and which has been constructed in accordance with the requirements of the highest class at Lloyd's both as to hull and machinery. Her dimensions are:—Length, 400 ft.; breadth, 45 ft.; gross tonnage, 4,000. The *Ameer* has been built with cellular bottom for water ballast, is supplied with patent steam windlass and steam steering gear, and will be provided with ample facilities for quick loading and discharging of cargo. She will also be fitted with the electric light installation, including powerful projectors to facilitate navigation through the Suez Canal at night. The *Ameer* will have four masts, captain's house on the bridge deck, officers' quarters in bridge-house, and accommodation for the crew in the fore-castle. She will be fitted with surface-condensing triple-expansion engines of the most approved type, also constructed by Messrs. Harland & Wolff. It is expected that the vessel will be ready for sea in about a month. It is some 26 years since Messrs. Harland & Wolff built for Messrs. Brocklebank their first sailing vessel, and others followed at intervals, making 10 in all.

**Osseo.**—On September 14th a steel barque, of 1,400 tons register, was launched from the shipbuilding-yard of Mr. Charles J. Bigger, Foyle Shipyard, Londonderry. As the vessel left the ways she was christened *Osseo* by Mrs. D. B. M'Corkell, Londonderry. The *Osseo* is built to the order of Mr. B. H. M'Corkell, Londonderry, and is of the following dimensions:—Length, 240 ft., by 37 ft., by 21-6 ft. Her carrying capacity will be about 2,300 tons. She is built considerably above Lloyd's highest class, and is fitted with all the most recent improvements, including donkey boiler and steam winch. She is fitted with full poop and top-gallant fore-castle with house amidships for crew. The *Osseo* will be entirely finished in Derry, and will be ready for sea in less than three weeks.

#### LAUNCH—GERMAN.

**Heidelberg.**—On August 28th the steamer *Heidelberg*, built on account of the German Steam Shipping Co., Hansa, at Bremen, was successfully launched at the yards of the Elsinore Iron Shipbuilding Co., Elsinore, Denmark. The *Heidelberg* is built of steel, and the following are her principal dimensions:—Length, 270 ft.; breadth, 37 ft.; and depth of hold, 16 ft. She is to carry about 2,300 tons deadweight. The engines are on the triple-expansion principle, and are intended to indicate 850 H.P. The boilers are constructed for a working pressure of 160 lbs. per square inch. The same day the keel was laid for a new steamer for the Danish Steam Shipping Co., Denmark.

## LAUNCH—SWEDEN.

**Bleak.**—On August 15th a large petroleum steamer, the *Bleak*, was launched from the yard of the Lindholmen Shipbuilding & Engineering Co., at Gothenburg, Sweden. She is built on account of the Russian Steam Navigation & Trading Co., of Odessa, and is the largest petroleum steamer in existence, her length being 325 ft., breadth 40 ft., and depth of hold 27½ ft. The *Bleak* will be able to load 3,400 tons, and depth in the water, fully loaded, is 21 ft. Her engine is to indicate 1,000 H.P.

## LAUNCH—DUTCH.

**Merapi.**—On September 10th the Royal Shipbuilding and Engineering Co., the Scheidt, at Flushing, in Holland, launched from its shipbuilding yard a steel screw steamer, *Merapi*, built to the order of the Rotterdam Lloyd's, for their fortnightly mail and passenger service between Rotterdam and Java. The vessel has the following dimensions:—Length over all, 332 ft. 10 in.; breadth of beam, 37 ft.; depth, 27 ft.; and a carrying capacity of 3,500 tons. Her engines will be supplied by the same builders, and are a quadruple compound of about 1,600 I.H.P. The working pressure is 200 lbs.; forced draught is fitted on the closed ashpit system. The cylinders are 23 in., 33 in., 43 in., and 63 in., by 42 in. stroke. By a simple and systematic arrangement of air currents induced by the heat radiated from the boilers, the temperature in the stokeholes, even in the tropics, is reduced to a maximum difference of 15 deg. Fah. above the outside atmosphere, this result having been accomplished in the s.s. *Bromo*. It is interesting to note that the order for these engines was given on the favourable results obtained by the s.s. *Bromo*, built last year by this firm for the same owners, and of which these are an exact duplicate, the greater simplicity telling greatly in their favour in comparison with the ordinary triple-cranks engine. The ceremony of launching the vessel was performed by H.R.H. the Princess of Wied.

## TRIAL TRIPS.

**Tynedale.**—On August 23rd, the new steel steamer *Tynedale* just completed by Messrs. Ropner & Son, Stockton-on-Tees, for C. Furness, Esq., West Hartlepool and Newcastle, made her trial trip. She left Middlesborough Dock early in the morning, and had a very successful run off the Tyne. Mr. Stoker, manager of the Newcastle branch, being present, expressed himself highly satisfied. A large party of ladies and gentlemen were also on board. Previous to the trip the *Tynedale* loaded her cargo at Middlesborough for Montreal. Her engines are by Messrs. Blair & Co., Limited, Stockton-on-Tees, on the triple-expansion principle, and both ship and engines are equipped with all the latest improvements.

**Paraense.**—On August 24th the trial trip took place of the steamer *Paraense*, which has been fitted by Messrs. Westray, Copeland & Co., of Barrow, with new triple-expansion engines. Although the vessel is 20 years old she presents a smart appearance, and reflects great credit upon the original designer, Mr. George Hepburn, the well-known naval architect of this city. She was built by Messrs. Thos. Royden & Sons, when the most improved engines were introduced. These, however, have been replaced by the more modern high-pressure and triple-expansion engines, with new boilers, and are similar to those fitted to the sister ship, the *Lisbonense*, which have proved such a great success, effecting a saving in fuel of over 25 per cent., with an additional advantage in the machinery space. The new engines are on the three crank principle, viz., high, intermediate, and low pressure. There is only one boiler, double-ended, working at a pressure of 160 lbs. per square inch. The cylinders are 23 in., 36½ in., and 58 in., with a stroke of 36½ in. Throughout the whole trial everything worked in a most satisfactory manner, and the vessel made an average speed of over 12 knots between Barrow and Llandudno, where a number of those interested in the trial landed, all of whom expressed themselves highly satisfied with the result. Messrs. R. Singlehurst & Co., the owners, were represented by their superintendent, Mr. William Isaacs.

**Norna.**—On August 26th the new screw steamer *Norna*, built of steel by Messrs. S. & H. Morton, Leith, to the order of Messrs. J. T. Salveston & Co., Grangemouth, for the Baltic trade, went on her official speed trial on the Firth of Forth. The

*Norna* is a vessel 223 ft. long, 32 ft. 9 in. broad, and 16 ft. depth of hold, and has triple-expansion engines, constructed by the builders, the diameter of the cylinders being 16½ in., 27 in., and 42 in. respectively, with a piston stroke of 33 in. The speed attained on trial was equal to 11.7 knots per hour.

**Mombassa.**—On August 26th the *Mombassa* (s.s.), built at Sunderland by Mr. J. Laing for the British India Steam Navigation Co., was taken on her trial trip along the coast. The steamer being one of the largest built on the Wear, the attendance on board was large and representative, and the trip was much enjoyed by all who took part in it. The steamer, which had been at sea all night, was boarded by a numerous company shortly after noon off the harbour, and she proceeded south as far as Runswick Bay, giving the passengers fine views of the Yorkshire coast scenery up to Whitby and Robin Hood's Bay. Among those on board were Mr. James Laing, J.P., Mr. Arthur Laing, and Mr. James Laing, jun., Mr. Henry Clark and Mr. Geo. Clark (Southwick Engine Works), Captain Hodgkinson (representing the British India Steam Navigation Co.), Captain M'Farlane (commanding the *Mombassa*), Colonel S. J. Ditchfield (Seaham Harbour), Major Owen, R.A., Captain Alexander (of the Wear Steel Works, representing Messrs. Beardmore & Co., Glasgow), R. J. Reed (chief surveyor of Lloyd's at Sunderland), &c. During the run luncheon was served in the saloon, the company being waited upon by the coloured stewards. After the repast, Mr. James Laing, who occupied the chair, proposed "Success to the *Mombassa*." He said that the steamer had just been transferred to a large and important company. When he mentioned that the company to which she belonged owned nearly 100 steamers, and that the *Mombassa* was not their largest one, they would have some idea of the amount of tonnage which they possessed. The chairman of the company was Sir William Mackinnon, whose name was known in London, in India, and in fact all over the world. The company, of which he was president, was prospering owing to his able and active management. He regarded the fact that he had been entrusted with the building of the vessel as a great compliment to himself personally, and his staff looked upon it in the same light. He believed the people of Sunderland would also consider that the British India Steam Navigation Co. had paid the town a compliment in coming here for a vessel. All the conditions which he undertook to fulfil with regard to capacity, carrying power, speed, and development of power of engines, he was glad to say had been amply fulfilled. He coupled with the toast the name of Captain Hodgkinson. Captain Hodgkinson stated that the vessel had given every possible satisfaction, and that they had nothing but words of praise to say with regard to her. At that present moment she was going a speed of 12 knots an hour with a cargo which included 6,200 tons of coal. She was in every way a credit to the Deptford Yard, which was one of the oldest in the kingdom, and he believed, the oldest in Sunderland. The company were landed at the South Dock, and the *Mombassa* proceeded on the following day on her voyage round the Cape to India.

**Rei de Portugal.** On August 26th this splendid steamer of 3,400 tons register, built by Messrs. Scott & Co., Greenock, for the Mala Real Portuguesa, of Lisbon, went down the river on her official trial trip, and at the close of a severe test—six hours continuous steaming—it was found that her rate of speed averaged over 15 knots an hour, being nearly three-quarters of a knot above the guaranteed rate. She had over 2,000 tons of coal on board. Her engines and machinery worked without a hitch. The results attained were considered eminently satisfactory by all concerned. She is coated with Hartmann's Rahtjen's Composition.

**Montevideo.**—During the last week of August this fine steamer, recently constructed by Messrs. Wm. Denny & Bros., Dumbarton, for the Compania Transatlantica de Barcelona, underwent two official trial trips, the first under natural draught, and the second under forced draught. The results were extremely satisfactory. The first trial consisted of four consecutive runs between the Cloch and Cumbræ lights, and the mean speed was 15.75 knots. The second trial was made to test the forced draught arrangement fitted in the ship on the closed stokehold principle. In order to ascertain what maximum power could be obtained from the boilers, it was decided by the company's superintending engineer, Mr. Coleman, to use only two boilers out of the three. The result, a mean of two runs between the Cloch and Cumbræ lights, was a speed of 15.35 knots, the indicated power being at the rate of

19½ per square foot of fire-grate. The trials were attended by Don Eugenio Bazona, the representative of the company, who superintended the trials on deck, while the engine-room was supervised by Mr. Coleman. This vessel has dimensions 410 ft. by 48 ft. by 32 ft., and is of the citadel deck type, with poop and fore-castle. In the poop there is accommodation for upwards of 30 second-class passengers, while upwards of 80 first-class passengers are accommodated in the citadel deck. The saloon, tastefully finished in polished hardwoods, occupies the entire breadth of the ship, and forward of it are four rows of state-rooms of much larger size than those usually seen on board of passenger steamers; while the remainder of the first-class accommodation extends aft in the citadel deck passages. The saloon is ventilated by a well through the music-room, which is finished in satin wood, and furnished with a piano by Broadwood. The captain's accommodation, consisting of two large rooms, is on the top of the citadel deck, above which there is a chart-room for the navigation of the ship. The officers and engineers are berthed partly in the fore end of the poop, and partly in the citadel deck passages. The vessel is fitted throughout with all the latest appliances, the double electric light plant consisting of two tower spherical engines coupled direct to Paterson & Cooper dynamos, driving 300 incandescent lights throughout the vessel. One of Haslam's 10,000 ft. refrigerators is also fitted for the purpose of preserving provisions for the passengers. The cargo gear is hydraulic, of Messrs. Brown Bros. & Co.'s latest patent. There are hydraulic derricks for serving Nos. 1, 2, and 4 hatches, with special topping and slewing cylinders on them, while two improved hydraulic cranes work No. 3 hatch. On the poop aft there is fitted a powerful hydraulic winch for warping the ship and working the boats, while forward there is a hydraulic capstan and windlass by the same makers. The steering apparatus is particularly worthy of remark, being also hydraulic, while all chains or steering ropes are entirely done away with, Messrs. Brown Brothers' latest invention, the "telemotor," being brought into force. The *Monterideo* has three stations for steering by hydraulic power, viz., one on the flying bridge, one in the chart-room, and one at the after end of the poop, close beside the auxiliary hand steering gear. On the trials this apparatus worked to perfection. On the 'tween decks there is fitted accommodation for a very large number of emigrants, this vessel being intended to trade from Cadiz to Monte Video. The outfit of boats carried is extraordinarily large, consisting of a steam launch, four lifeboats, a cutter, and a gig, while in addition are carried six of Chambers's patent collapsible boats, each of which is equal in capacity to one of the largest lifeboats. The machinery is on Brock's patent quadruple principle, and steam is supplied by three double-ended boilers, working at 180 lbs. pressure; while all the usual fittings in the way of Weir's pumps, feed heaters, distillers, Worthington deck service pump, and centrifugal bilge pump are fitted. The vessel left for Cadiz on the 2nd September.

**Leconfield.**—On Saturday, August 31st, the new steel screw steamer, *Leconfield*, built by Messrs. Schlesinger, Davis & Co., of Wallsend-on-Tyne, for Messrs. G. R. Sanderson & Co., of Hull, was taken out to sea for her trial. A few weeks ago, on the occasion of the launch, full particulars were given of her dimensions and arrangements, and we need not now repeat them. The *Leconfield* was loaded with 3,300 tons of cargo and fuel, and the engines, which were made by Messrs. Black, Hawthorn & Co., of Gateshead, worked very smoothly and well during the time the steamer was at sea, but no actual trial of her speed was obtained, owing to the fog which prevailed. The machinery and hull have been constructed under the superintendence of Mr. R. Carson, superintendent engineer, Hull. The vessel was coated with Messrs. Bruce & Co.'s "Nomos" composition. After waiting some time on account of the fog, the vessel proceeded on her voyage to Alexandria, in command of Captain J. W. Massam.

**Activ.**—On September 2nd the new screw steamer *Activ* left Bill Quay for her trial trip. The steamer, which is a cargo vessel, has been built by Messrs. Wood, Skinner & Co., Bill Quay, for Mr. Shoresen, of Norway. She is of the following dimensions, viz.:—Length, 250 ft. by 35 ft. by 16 ft. 2 in. draught. The engines, which are of the triple-expansion type, have been built by the North-Eastern Marine Engineering Co., Wallsend. During the trial the machinery ran with perfect smoothness, and without any hitch whatever. The owner of the vessel was on board, and expressed himself as highly satisfied with the results obtained.

**Isle of Java.**—On September 2nd the new screw steamer *Isle of Java*, which has been built by Messrs. T. and H. Smith, North Shields, for Messrs. Dixon, Robson & Co., of Newcastle, the owners of the well-known Isle line of steamers, left North Shields for a trial trip. This steamer is a handsome cargo vessel of the following dimensions, viz.:—215 ft. by 30 ft. 6 in. by 14 ft. 5 in. draught, and is fitted with every modern appliance for rapid and economical working. The engines, which have been built by the North-Eastern Marine Engineering Co., Limited, Wallsend, are of the tri-compound system, and throughout the trial ran without any stoppage or hitch of any kind whatever. They gave every satisfaction to all concerned, and during the day several runs on the measured mile were taken with most satisfactory results.

**Adula.**—On September 5th the steamer *Adula*, recently launched by Messrs. MacIlwaine & Maccoll, Belfast, went out on trial. This vessel has been built for the Atlas Steamship Co., to the order of Messrs. Leech, Harrison & Forwood, Liverpool, and the owners were represented on the trial by Mr. A. B. Forwood, M.P., Secretary of the Admiralty. The vessel has been specially arranged for service in the West Indies, being intended to call at the various ports round the island of Jamaica, and is fitted with excellent accommodation for sixty-four first-class passengers. The *Adula* is 212 ft. long by 29 ft. beam and 13 ft. deep, with triple engines, 18 in., 30 in., and 49 in. diameter of cylinders, by 33 in. stroke, steam, at 160 lbs. pressure, being supplied by two steel boilers and six furnaces. The machinery worked without a hitch all day, and after compasses had been adjusted, the vessel ran at a speed of 12·8 knots for several hours. After the trial Mr. Forwood expressed his great satisfaction at the completeness with which all their many and difficult requirements had been fulfilled.

**Sando.**—On September 6th Messrs. Earle's Shipbuilding and Engineering Co., Limited, Hull, took on her trial trip the s.s. *Sando*, which they have just completed for the Grimsby White Star Co. to the order of Mr. H. Smethurst, jun., of Grimsby, for North Sea line and trawl fishing. Her dimensions are 105 ft. by 20 ft. 6 in. by 11 ft. 6 in., and she has a perforated fish-well amidships in addition to the usual fish and ice holds. Her engines consist of a set of triple-compounds with cylinders 12½ in., 20 in., and 32 in. diameter by 22 in. stroke. The vessel proceeded down the river from Hull Roads to have her compasses adjusted off Grimsby, and a course was then made for the measured miles at Withernsea, where very satisfactory results were attained, the mean speed developed being close on 10½ knots when running at 148 revolutions with 150 lbs. of steam.

**Manhattan.**—On September 6th and 7th the official trials of this steamer were made, when results of a most satisfactory nature were obtained. The *Manhattan* is a large screw steamer, built and engined by Messrs. David J. Dunlop & Co., Port-Glasgow, for the Anglo-American Oil Co., Limited, and is one of two sister vessels specially designed and constructed to carry petroleum in bulk from America to this country. Her length on the load line is 380 ft., and she is capable of carrying 4,000 tons oil and sufficient coals for the return voyage. She is most substantially built of steel, in excess of Lloyd's requirements, and is subdivided into 18 oil-tight and six water ballast trimming tanks. Before the vessel left the builders' dock the oil tanks were tested to a 20 ft. head of water under the superintendence of Lloyd's and the owners' consulting naval architect and engineer, Mr. George Eldridge, of London, the tests in every case being successfully withstood. The steam pumps with which the vessel is supplied are capable of running into or out of the tanks 4,000 tons of oil or water in 10 hours, so that a test of speed at various immersions is a comparatively simple matter. On a series of runs on the measured mile on Friday, a speed of 11½ knots was obtained. On the trials September 7th the owners were represented by Mr. J. D. Jamieson, a director of the company, and Mr. George Eldridge, the company's consulting engineer, and there was a large company of ladies and gentlemen present. The tanks were filled so as to give an immersion of 22 ft., and a series of runs were made upon the mile at varying revolutions, a speed of 11 knots being attained with the engines working in splendid condition and steam blowing off—this speed being a full knot beyond requirements, and acknowledged by Mr. Jamieson and Mr. Eldridge to be most satisfactory. The trials completed, the steamer proceeded on a cruise towards the Cumbraes, during which dinner was served in the spacious and ornate saloon in the after quarter of the steamer.

**Foxhound.**—On September 9th the steam trawler *Foxhound*,

built for the Humber Steam Trawling Co., Limited, by Messrs. Cook, Welton & Gemmel, went on her trial trip. The company on board included Mr. R. Simpson, managing director; Mr. Gemmel, representing the builders; Mr. Walker, representing the Humber Ironworks, who supplied the engines, and many other gentlemen. After Middle Lightship was reached, a fine run was made down to the Newsand Float, and then out to sea. On the return journey a good run was made from the Newsand to the Middle, and the average speed proved to be  $10\frac{1}{2}$  knots, which was considered very satisfactory. This is the 10th boat Messrs. Cook, Welton & Gemmel have built for the Humber Steam Trawling Co., under the inspection of Mr. R. Simpson. The *Foxhound* is sister ship to the *Excelsior*, and is a fine addition to the company's fleet now sailing out of Hull.

**Persian.**—On September 10th the steamer *Persian*, belonging to Messrs. F. Leyland & Co., went on her official trial trip, after having had new cylinders and boilers fitted for a working pressure of 150 lbs. per square inch. The engines, working at 66 revolutions, indicated 1,250 H.P., and the vessel attained a mean speed of 12 knots. The foregoing work has been carried out by Messrs. David Rollo & Sons, engineers, of Liverpool, under the direction of the company's superintendent engineer, Mr. Neville Evans. This is the third steamer that has been altered for the above-named company by Messrs. David Rollo & Sons.

**Inchmarlo.**—On September 11th the new steamer *Inchmarlo* left the South Dock, Sunderland, for a series of runs over the measured mile. She has been built by Messrs. Robert Thompson & Sons for the Inch Line, Liverpool, of which Messrs. Hamilton, Fraser & Co. are the owners. The dimensions are 332 ft. long by 42 ft. beam, and 29 ft. moulded depth, with 7 ft. 10 in. 'tween decks. She is built on the three-deck rule to the highest class at Lloyd's, with bridge, poop, and topgallant forecabin, which are covered with yellow pine. Throughout she is constructed of steel, except the upper deck and cellular bottom, which are of iron. She carries 4,800 tons deadweight on Lloyd's freeboard, her hold space containing 216,000 ft., and permanent bunker space 520 tons. The steam steering gear, which is fitted inside the engine-room casing and worked by controlling rods from steering house on top of the chart-house, is by Maginnis & Co., and is worked by a shaft by means of a worm direct on the quadrant. This gear worked exceedingly smoothly and quickly, and gave the most complete satisfaction. The engines are of the triple-expansion type, by Messrs. Thos. Richardson & Sons, of Hartlepool, the cylinders being 25 in., 40 in., 68 in., and 42 in. stroke. There are two large double-ended boilers, 160 lbs. pressure, 4,800 square feet of heating surface. After a succession of runs over the measured mile, a mean speed of 12 knots was obtained, the vessel being only in ballast. The vacuum was 28 in., steam 162 lbs., revolutions 84, and I.H.P. 1,700. Mr. Robinson, assistant manager to the engine builders, was in charge of the engine-room with an efficient staff.

**King Alfred.**—On September 12th the screw steamer *King Alfred*, recently launched by the Blyth Shipbuilding Co., from their works at Blyth, was taken to sea for the customary trial trip. A party of gentlemen, including the owner and friends and representatives of the shipbuilders and engineers, proceeded to the vessel by tug about mid-day, after which a trial of speed was made, with results which were highly gratifying. The steamer afterwards returned to Blyth, and was placed on turn to load for Malaga under the command of Captain Hebron. The *King Alfred* is built of steel and iron, and measures 225 ft. between perpendiculars; moulded breadth, 32½ ft.; and 16 ft. 7 in. depth. She classes 100 A 1 at Lloyd's, and is fitted throughout in the most complete manner. The engines are from the North-Eastern Engineering Co., of Wallsend, with cylinders 16½ in., 27 in., and 44 in. by 33 in. stroke, and an ordinary working pressure of 160 lbs. The machinery, as well as the hull, have been constructed under the superintendence of Mr. James Dykes, superintendent engineer of Newcastle, for and on behalf of the owner, Mr. Owen C. Philipps, of Glasgow.

**Cazengo.**—On Thursday, September 12th, the s.s. *Cazengo*, which has just been completed for the Empreaza Nacional, of Lisbon, by Messrs. Earle's Shipbuilding & Engineering Co., Limited, Hull, was taken on her trial trip, with the representatives of the owners and builders and a large party of their friends on board. This steamer has been constructed for the mail and passenger service between England, Lisbon and the west coast of Africa, and is a sister ship in all respects to the s.s. *Ambaca*, which underwent her trials recently, the dimen-

sions being:—Length, 340 ft.; breadth, 41 ft.; depth of hold to top of floors, 28 ft., and she is propelled by a set of triple-compound 3-crank engines, with cylinders 32 in., 48 in., and 80 in. diameter, by 48-in. stroke, supplied with steam from two large double-ended steel boilers. Her passenger accommodation is arranged for 72 first-class, 32 second-class, and 120 third-class, including elaborate saloons, sleeping quarters, smoke-room, &c. The vessel had on board about 1,700 tons deadweight, and the measured mile runs resulted in an average of nearly  $14\frac{1}{2}$  knots, which was considered very satisfactory, and was in excess of the contract speed. A long distance trial of five hour's duration was then made on a course past Flamborough Head, and then back to Spurn, when the previous good results were maintained, the engines working most smoothly, and up to full power throughout the run.

**Cambridge.**—On September 13th the steamship *Cambridge*, a new vessel, built by Messrs. Swan & Hunter, of Wallsend, for Messrs. Mark Whitwill & Sons, Bristol, had a very satisfactory trial trip from the Tees. Her engines are of the triple-expansion type, of 175 N.H.P., and have been supplied by Messrs. Blair & Co., of Stockton.

**Baltimore.**—On September 14th the new American warship *Baltimore*, built to attain a speed of 19 knots, with 9,000 H.P., had her trial trip, and developed 10,000 H.P., with a speed varying from 19.3 to 20.2 knots. Her builders, who claim that she is the fastest warship afloat, will get a premium for increased H.P. Her trial continued for four hours in a rough sea outside the Delaware Capes. The *Baltimore* was built from English designs. When Mr. W. H. White, now Director of Naval Construction, was leaving Elswick four years ago, the United States Government bought from the firm with which he was then connected the plans for two vessels. One of those, the *Charleston*, is a sister ship of the two Japanese cruisers designed by Mr. White and built in 1884-85. She was built at San Francisco, and passed her trials very successfully. The other is the *Baltimore*, which was a new design of Mr. White's in 1885. Detailed working drawings were furnished for both hulls and engines, those for the engines being supplied by Messrs. Humphrys & Tennant.

**Durham.**—On September 17th the new screw steamer *Durham*, built and engined by Messrs. Robert Stephenson & Co. Limited, was taken on her trial trip. The ship is of the following dimensions:—Length, 330 ft.; breadth, 41 ft.; and depth, 27 ft. 9 in. The engines are of the triple-expansion type, having cylinders 25½ in., 41 in., and 67 in. diameter, and a stroke of 42 in., supplied with two large double-ended steel boilers, working at a pressure of 160 lbs. All have been built under the superintendence of Mr. H. C. Ashlin, naval architect and engineer, of London. After compasses were adjusted, several runs were made, the vessel being fully loaded with 4,500 tons on board, when a mean speed of  $10\frac{1}{2}$  knots per hour was attained on the measured mile, the engines working smoothly and without the slightest hitch. The owners were represented by Mr. Clifford Wigram, Captain Page, and Mr. A. Beldam, who expressed themselves highly satisfied with the performance of both vessel and engines. After the trial the *Durham* steamed away direct on her voyage to Malta and Batoum.

**Syria.**—On Wednesday morning, September 18th, the s.s. *Syria*, a fine iron steamer, built for Messrs. Bailey & Leatham, of Hull, by Raylton, Dixon & Co., Middlesbrough, proceeded from the Tees on her trial trip to the Tyne. Her leading dimensions are:—287 ft. by 38 ft. by 21 ft. 9 in., with a deadweight of 3,000 tons. This vessel is built on the raised quarter-deck principle, having long bridge extending to forehatch, short poop aft, top gallant forecabin, and in every way fitted as a first-class cargo steamer. Her engines, which are by Mr. George Clark, of Sunderland, of 170 N.H.P., with cylinders 21 in., 34 in. and 56 in. by 39 in. stroke, gave every satisfaction on trial. She will be commanded by Captain Morley, the senior captain in this line, and has been built under the inspection of Mr. Thompson, superintendent for her owner.

**Margaret.**—On September 20th, the *Margaret*, lately launched by Messrs. John Fullerton & Co., Paisley, went down the river on her official trial trip. After adjusting compasses at Gareloch, the owners and a numerous company of friends joined the steamer at Greenock, which at once proceeded to run the measured mile at Skelmorlie. The average speed attained was 11 knots. The *Margaret* has been built to the order of Messrs. Pattinsons & Winter, steam millers and corn factors, White-

haven, for their own trade, and is fitted with all the latest improvements. The engines, which were supplied by Messrs. Ross & Duncan, Govan, are of the compound type, and worked admirably during the entire day.

**Prince Albert.**—The *Prince Albert*, built at Antwerp, for the Dover and Ostend service by the John Cockerill Co., and fitted with diagonal compound engines and boilers from their works at Seraing, was taken on her official trial trip recently, in which she showed a mean speed of 19 knots an hour. Another and similar steamer is nearly finished, which will enable both the night and day services of this line to be carried on by fast boats.

**ERRATUM.**—In the account of the trial trip of the *Dunmore Head*, we stated in our last number that she was engined by Messrs. J. & G. Thomson, it should read J. & J. Thomson, Finnieston Engine Works, Glasgow.

**RAPID ATLANTIC STEAMING.**—The three steamers, *City of New York* (Inman Line), *Teutonic* (White Star Line), and *City of Rome* (Anchor Line), left New York within half-an-hour of each other on Wednesday afternoon, the 21st ult., and made a remarkable passage home. The *City of New York* arrived first off Browhead at half-past eight on the following Tuesday evening, her daily runs being as follows:—351, 433, 450, 452, 444, and 225 miles, to Queenstown, the actual passage from Sandy Hook to Queenstown being 6 days, 3 hours, 18 minutes; her former passage in May last being only 6 days, 0 hours, 29 minutes. The *Teutonic* arrived 13 hours 10 minutes after the *City of New York*, but she was detained by having to pass through a thick bank of fog. The *City of Rome*, in her last outward passage to New York, has beaten her previous record of 5 days, 23 hours, 7 minutes in May last, by accomplishing the passage in 5 days, 19 hours, 18 minutes; her daily runs being 432, 493, 502, 506, 509, and 346 miles, to Sandy Hook; the fastest outward passage of any other steamer previous to this being that of the *Etruria*, in May, 1888, the time being 6 days, 1 hour, 47 minutes.

**A FIRE FLOAT.**—Messrs. Edward Finch & Co., of Chepstow, have just completed, and delivered at Barry Dock, a large fire float. The boat is of the following dimensions:—Length, 70 ft. over all; beam, 14 ft.; depth of hold, 8 ft.; and draws about 7 ft. 6 in. The engines are on the high-pressure system, the cylinders, of which there are two, being 22-13 inches in diameter, and the stroke of the piston is 15 in. The boiler is on the locomotive principle, and is capable of generating steam from cold water in the remarkably short time of 18 minutes, which is very important in case of fire breaking out in the dock. The vessel is also fitted with Cochran's duplex donkey pump, which can pump against a pressure of 115 lbs. This pump is specially fitted for feeding the main boiler during the working of the fire-pumps, of which there are two. These pumps are supplied by Messrs. Fielding & Platt, of Gloucester, the cylinders of which are 32 in. diameter each, the plunger on each pump being 24 in., and the stroke 18 in. An air vessel is fitted on deck with four jets, the bore of each being 3 in. in diameter. The water from these jets can be thrown to a height of 250 ft. This vessel has been specially built as a fire float, but, in addition to her capabilities for this work, she is fitted with tanks that will hold 20 tons of fresh water for feeding boilers and supplying vessels in dock. The engines were tried at Chepstow, when the boat steamed at the rate of nine knots an hour, which was considered very satisfactory. The pumps were also tried, and again at Barry, everything working very satisfactory.

THE Admiralty have contracted with Messrs. J. Penn & Son to supply and fit the engines and boilers of the new fast cruisers *Scylla* and *Sappho*, which have just been ordered to be built for the Royal Navy by Messrs. Samuda, of Blackwall, London. The *Scylla* and *Sappho* will be 300 ft. in length, and fitted with triple-expansion machinery, estimated to develop 9,000 H.P., with a speed of 20 knots per hour under forced draught, and 6,000 H.P. with a speed of 18 knots per hour. They will have a displacement of 3,400 tons, and are to be armed with two 6-inch breech-loading guns, six 4-7-inch, and nine 3-pounder and 6-pounder quick-firing guns, together with a strong equipment of torpedoes. The *Cyclops*, 4, coast defence ship, 3,560 tons, 1,660 H.P., Commander H. H. Barnard, was paid out of commission in the Medway to-day, and placed in the second division of the Medway Steam Reserve.

## Reviews.

*Modern Workshop Practice.* By John G. Winton. London: Crosby Lockwood & Son.

THE fourth edition of this standard work is now before us, and in compiling it the author has taken the opportunity of revising it throughout, and embodying in its pages the most recent results of engineering practice. As showing that the additions made have been considerable, we need only state that it has been necessary to enlarge the present edition by more than forty pages, and amongst the new matter thus introduced will be found detailed descriptions of recent examples of high-class locomotive engines, illustrated with new and specially prepared engravings; practical details of gas and its manufacture; an account of steam fire engines, and of the work done by steam and manual engines, &c.

The work is written by a practical man, and forms one of that most useful collection, "Weale's Rudimentary Series," the uniform high quality of which is too well known to need any encomium at our hands.

We notice that out of the 342 pages forming the present edition of his book, the author has devoted no less than 169 pages to "The Marine Engine" and "Shipbuilding," and students, either of marine engineering or naval architecture, would do well to procure and carefully read Mr. Winton's most serviceable book.

*Pollock's Dictionary of the Clyde.*

THAN this handy, compact, and well-arranged work, no better guide-book could possibly be selected by those who wish—in addition to being guided to the scenic beauties of the Clyde—to familiarise themselves with the industries, commerce, and shipping of the great Scottish river. The first portion of the work consists of a descriptive itinerary of the whole district, written in such a manner as to guide and satisfy the tourist who has but limited time at his disposal. The second, and major portion consist of an alphabetically arranged and fully detailed gazetteer to every town, village, mansion, and industrial establishment situated on the banks or lying within the natural basin of the river. A special feature of the volume consists of articles by well-known specialists on such subjects as "Shipbuilding," "Harbours and Docks," "Lights, Buoys and Beacons," "Geology of the Clyde Valley," "Botany, Birds, Fisheries, Angling, Angling clubs, Art and the Clyde," "Poets and Poetry, and the Yachts and Yachting of the Clyde." As in the case of Loch Lomond, which formed the subject of a lengthy article in last year's issue, it has been considered that Oban and the West Highlands forms an integral part of the scenic province of the Clyde, and an elaborate descriptive article of that province has therefore been introduced in this year's edition. The Dictionary is certainly a marvellous shilling's-worth. It is published in London by Simpkin & Marshall, and in Glasgow by Menzies & Co.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

### TRIPLE-EXPANSION ENGINES.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—In your June number are published the very complete and interesting trials of the triple-expansion engines of s.s. *Meteor*. I should like to ask if we are to consider these engines as being very economical, and fair specimens of a triple-expansion engine. I read, "It will thus be seen that even in these very economical engines," &c., &c.; further on I read that the consumption is 2.01 lbs. per I.H.P. per hour, percentage of ashes and clinker, 6.51 per cent.; temperature of feed water

from 160 deg. to 170 deg. I notice the percentage of ashes, &c., is very low, so conclude the coal is of good quality. The lbs. of feed water, temperature of gases, &c., may be left out as far as the shipowner is concerned. To him it is the relative economy of triple and compound engines in £ s. d., in fuel.

I compare this trial with the trial made by, I believe, the late Mr. Wylie, for three days under ordinary conditions, on board the *s.s. Para*, and published in your December number of 1886, in which, with soft north country coal, giving 10 per cent. of ash, the consumption was 1.5 lbs. per I.H.P. per hour. Although these trials were not so elaborate as the *Meteor's*, the author states, "These being his fuel triple-expansion engines, special arrangements were made for ascertaining the coal consumption per I.H.P."

The trial as published also appears satisfactory, and no mention is made of a feed heater, so we may assume feed temperature to have been about 180 deg. I also observe in the case of the *Meteor*, the pumps were not driven with steam from main boilers, as in the *Para*.

Coming now to diagrams, in the *Para* the greatest difference in H.P. between any two cylinders is about 12; in the *Meteor* it reaches 318, and in the supplementary trial, Table 1, Set A, it reaches to 615. Why all this power extra in the L.P. engine, and is this considered balanced, and what about the extra strain on crank pin, and would this be conducive to good and safe working—to say nothing of smoothness in running—on a voyage of, say 23,000 miles?

I note a still greater difference in the diagrams following these. Why all this difference? There are, I believe, triple-expansion engines working as low as 1.3 and 1.4 lbs. per I.H.P. of Welsh coal per hour. Superintendent engineers might enlighten us upon this prominent question of coal consumption with triple and compound and quadruple and triple from actual working, they, no doubt, having the most reliable data—that is, actual work on long voyages.

Yours faithfully, C. J. B.

#### FAST PASSAGES.

To the Editor of THE MARINE ENGINEER.

SIR,—In reference to your leader in the July number, on the "Fast passage of the *City of Paris*," I hope you will give these remarks a place in your esteemed paper.

I quite agree with you that the engineers should have all the praise and credit for the successful driving of the engine.

But that ends his claim and responsibility in the matter, and he has no more to do with "fast passages" than the man who drives a winch has to do with the fast discharge of a ship.

The captain is the man who makes or mars a passage; his the responsibility, anxiety, and constant duty; his the terrible risks in darkness, fog, or doubt. 'Tis he who keeps the headlong pace, and his constitution has to pay the price. What avail the engineers if the captain will not sanction more than eight knots—and less would, many times, be more prudent. But it is the captain who has to make a fast passage with his ship. The owners have given him charge of her, and all she contains, and the engineers cannot share his responsibility in any way.

I take it that a steamer is constructed to order, at great cost, with the object of beating all records, and to do so she is specially designed to carry a certain pressure of steam with safety, and the valves are loaded to that, and the keys given in the captain's charge.

Now, I consider, that whilst she is under that pressure the engineers fail in their duty to the owners, constructors and master of the ship; but, having reached that pressure, they cannot increase the speed, let alone make a "fast passage."

Again, if anything goes wrong with the engines, they are stopped and the damage rectified, if possible; if not, the engineers have done, but the captain is still responsible for their lives and his ship; and he must get her to port as best he may, without the mighty factor that makes the great speed.

Let the engineers do their very best, and it will be abortive, if the captain and his deck staff fail in their duty, for not only may the great speed stop, but the fast passage come to a sudden conclusion—as has been the case before now—sending the quarter million of money to "Davy Jones," and all hands to a tribunal where the engineers would plead no responsibility, when it came to their turn, after the captain.

I am,

Yours respectfully,  
JUSTICE.

#### WASTING AWAY OF CONDENSER TUBES.

To the Editor of THE MARINE ENGINEER.

SIR,—You were kind enough to insert in THE MARINE ENGINEER of January a note from me on the above, asking an expression of opinion from some of your many readers for a cause and remedy for the defect mentioned.

Mr. G. W. Rockcliffe, Demerara, gives two instances of similar defects which occurred in steamers under his superintendence. The steamer I wrote of has no supporting plate in the centre of condenser, same as steamers he mentioned; but if that be the cause, why not both ends of tubes be affected? And I have sailed in another steamer belonging to the same company, in which the tubes are fitted with wood ferrules, have no supporting plate, and are now at work almost seventeen years, whereas in the steamer in which the tubes have given trouble, the third set (900 tubes in condenser) are now fitted inside of eight years. This is, I think, well worthy of investigation; it is a continual source of labour to the engineers, and expense to the owners, and I have been unable to find out any cause up to the present, or to be satisfied that new tube plates and a centre plate will prevent this wasting or corrosion. It is to be remembered that it is only on the bottom side of the tubes in the ferrule that the wasting shows.

As I have found this a rather knotty question, I trust you will excuse me in again drawing the attention of your many readers to this subject.

I am, Sir,

Yours truly,

A MARINE ENGINEER.

Belfast,  
2nd September, 1889.

#### THE "TEUTONIC" (S.S.)

To the Editor of THE MARINE ENGINEER.

SIR,—In your account of the *Teutonic* in this month's issue you say she is 582 ft. long, the longest ship afloat. Such is, however, not the case. If you refer to THE MARINE ENGINEER for September, 1880, July, 1883, and other places in your paper, you will find the *City of Rome* is 600 ft. in length, consequently she is, if not the largest, still the longest ship afloat.

The *City of New York* and *City of Paris*, the largest ships afloat, are only 560 ft. over all.

I am, Sir, yours obediently,

GEORGE W. GREEN.

Gisbro', September 21st, 1889.

#### THE MAGNOLIA ANTI-FRICTION METAL.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—Referring to the notices of the great trouble caused by the heated bearings of H.M.S. *Hercules* during the recent Naval Manœuvres, we feel it necessary to remark that we and our principals, the Magnolia Anti-Friction Metal Co., have been subjected to enquiries as to whether these bearings were fitted with Magnolia metal. Our invariable reply has been that Magnolia metal was not in these bearings, and, moreover, had it been the trouble could not have occurred. But, of course, we cannot lay hold of this rumour in every direction, save by the aid of such a medium as your paper, and we shall therefore highly esteem the favour if you will insert these few lines in your October issue.

Yours truly,

ALLEN & ROBSON,

Agents for Magnolia Metal Co.

September 11th, 1889.

MR. JAMES M'KECHNIE, who lately held a responsible position in the engineering department of Messrs. James & George Thomson's establishment at Clydebank, has just left Glasgow for Bilbao, to take charge, as manager, of the engineering works in connection with Sir Charles Palmer's naval shipyard there. Mr. M'Kechnie goes with the best wishes of all who knew him. The works at Bilbao are newly constructed, and active operations are now in progress with the three cruisers building for the Spanish Government. It is not long since one of the keels was laid, and already the frames are well up. It is noteworthy that Mr. John P. Wilson, the manager of the shipyard, was also in the Clydebank establishment.

THE "CITY OF PARIS."—Americans are greatly elated by the passage of the steamer *City of Paris*. A meeting was called on board, and Mr. Medill, well known as the editor of the *Chicago Tribune*, pointed out that, although British built, the success is due to American enterprise, backed by American capital. He knew, he said, that the application of American inventions to the machinery of the steamship had increased her speed one knot an hour, and that nine-tenths of the capital of the Inman Line was American money. State Senator Warwick, of New Jersey, in his remarks, expressed regret that a ship owned by American capitalists could not fly the American flag, and closed with the epigram, "We live in America and go to Europe to see ruins." Other speeches were made praising the ship's steadiness, the officers' skill, and other things worthy of commendation.—*Anglo-American Times*.

OCEAN RACE.—Considerable interest is taken in the Transatlantic trips of the Inman Liner *City of New York*, the White Star Liner *Teutonic*, and the Anchor Liner *City of Rome*. All three left New York Wednesday, September 18th, at 2 p.m., and at New York considerable sums were laid on the rival steamers, especially the first two. On the night of September 24th, at 9 o'clock, the Inman Liner was first sighted off Browhead signal station. The time she has occupied from land to land is a little over six days two hours. The *Teutonic* passed the Browhead at 11.50.

FAST STEAMING FROM THE CAPE.—The Union Steamship Co.'s Royal steamer *Athenian*, which left Cape Town at 6.50 p.m. on September 4th, arrived at Southampton at 1 p.m. on Sunday, the 22nd inst., her gross passage being 17 days 18 hours, 10 minutes, and her net steaming time 17 days, 14 hours, 35 minutes. The distance run was 5,995 miles, giving an average speed of 14.2 knots per hour over the whole distance.

THE JUNIOR ENGINEERING SOCIETY.—Professor John Perry, D. Sc., F.R.S., becomes President of this society for the ensuing 9th Session, which he will inaugurate by the delivery of an address on "Mechanical Engineering in Electrical Industries."

### Recent applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, from August 17th to September 17th, 1889.

- 13038 J. Whitehouse. Steam-engine governors.
- 13041 O. Phalp. Compass cards, &c.
- 13059 J. Girdwood. Feedwater heater and evaporator.
- 18111 J. G. Daniel. Masts and rigging.
- 18180 P. W. Williams and M. H. Robinson. Steam-engines.
- 13132 De Pass (La Société de Spécialités Mécaniques). Divers helmets.
- 18152 Birkbeck (J. Edwards). Cleaning ships' bottoms.
- 18189 W. Brindle. Utilising rise of tides to obtain motive power.
- 18196 F. S. Pett. Ships' logs.
- 13216 H. L. Meadows. Ships' watchman shelter.
- 13232 C. H. Sanders. Passenger, &c., conveyance by steam-boat, &c.
- 13275 O. T. Hobday. Ships.
- 13283 E. L. Berthon. Collapsible boats.
- 13345 Thompson (P. Leonard and P. Zen). Anti-corrosive composition for ships.
- 13391 T. Bass. Raising, lowering and hauling.
- 13419 N. C. Parasho. Stopping the speed of a vessel.
- 13479 F. D. Owen. Rotary engines.
- 13490 W. H. Wise. Propelling ships.
- 13563 J. H. Smith. Enclosing breaches in ships.
- 13567 A. Lilley. Forged screws.
- 13605 R. S. M. de Ricci. Chain cables, chains and links.
- 13624 A. Wrigley. Mariners' compasses.
- 13650 C. A. Jensen. Hauling apparatus. (Messrs. Schüchtermann and Kremer.)
- 13683 W. P. Ingham and H. Bennett. Screw propellers.
- 13833 A. Robins. Centrifugal pumps.
- 13835 F. W. Pyle. Utilisation of tides for power.
- 13873 G. D. Davis. Ships' steering apparatus.
- 13905 G. W. Cass. Marine signalling.
- 13909 G. Unden. Steering apparatus for vessels.
- 13921 J. J. Goldsmith. Saving life apparatus at sea.
- 13922 Malmström and D. D. Eason. Propelling ships etc.

- 13966 E. Niblett. Uncapsizable life-boat.
- 13978 S. Black. Life-buoys, fittings for same.
- 13997 A. Spencer. Ships.
- 14035 R. R. Little, J. Hall, and T. Archer, jun. Apparatus for signalling on ships.
- 14146 M. Waldner. Life-saving apparatus.

### BOARD OF TRADE EXAMINATIONS.

NOTE.—1 C, denotes First Class ; 2 C, Second Class.

August 24th, 1889.

- Armstrong, Wm. 2C N. Shields
- Belford, Chas. S. 2C "
- Black, D. 2C Glasgow
- Boulden, G. R. 2C Cardiff
- Cochrane, Jas. 2C Glasgow
- Coe, John Wm. 2C N. Shields
- Craigie, Andrew. 2C Glasgow
- Dalley, Ed. 1C Cardiff
- Dodds, Wm. 1C N. Shields
- Drummond, Jas. 2C Aberdeen
- Durbrow, Ed. 2C Liverpool
- Evans, Lewis. 1C Glasgow
- Glaspool, J. H. 2C Sthmptn.
- Gilroy, T. M. 1C Aberdeen
- Humphreys, Jas. 2C Liverpool
- James, H. G. 1C Cardiff
- Kerr, Archibld. 1C Glasgow
- Magee, P. 1C N. Shields
- Morgan, A. J. 1C Cardiff
- Morris, W. C. 2C Liverpool
- Rennie, T. 2C Glasgow
- Ross, J. M. G. 2C London
- Stafford, R. W. 2C Cardiff
- Sutcliffe, A. H. 1C London
- White, Samuel 2C Glasgow
- Whitton, James 2C "
- Williamson, Jas. 1C Liverpool

August 31st, 1889.

- Atkins, Andrew 1C Sunderl'd
- Brown, J. Mop. 2C Liverpool
- Carr, Harry 2C Sunderl'd
- Chicken, W. T. 2C "
- Cooper, N. N. 1C N. Shields
- Devlin, Philip 2C Belfast
- Edmond, H. E. S. 2C London
- Fallerton, Wm. 2C Sunderl'd
- Fosbrooke, H. 1C London
- Foster, Henry 2C Liverpool
- Green, John 1C N. Shields
- Henderson, J. R. 2C N. Shields
- Kooner, J. H. 1C Sunderl'd
- Lindsay, Thos. 2C Liverpool
- Murray, John 2C Sunderl'd
- Musther, Geo. 1C "
- Nagle, William 2C Liverpool
- Pearcey, W. H. 1C Sunderl'd
- Richardson, W. 2C London
- Robson, J. T. 1C Sunderl'd
- Scott, Geo. 1C "
- Shiells, Jas. 2C "
- Sturrock, M. N. 2C N. Shields
- Tolman, F. 1C Sunderl'd
- Watson, Robt. 2C "
- Willis, T. B. 1C "

September 7th, 1889.

- Allan, Fredk. J. 1C Glasgow
- Bowden, Jas. M. 2C "
- Brodie, Hugh 2C Leith
- Brown, Hugh M. 1C Glasgow
- Cathcart, C. A. 1C Cardiff
- Clark, Wm. 1C Greenock
- Clarke, John P. 2C Glasgow
- Craddock, Wm. 1C Leith
- Davies, Edwin 2C Cardiff
- Deslandes, E. F. 2C "

- Dick, Geo. T. 2C N. Shields
- Evans, Owen J. 2C Cardiff
- Ferguson, G. H. 1C Glasgow
- George, Wm. 1C Leith
- Gilmore, Jas. B. 1C Glasgow
- Goodall, C. T. 1C Liverpool
- Hever, Jas. 1C London
- Holmes, John 1C Glasgow
- Johnston, Hugh 1C Leith
- Jones, Thos. C. 2C Glasgow
- Lloyd, John 2C Cardiff
- Lougher, Wm. 2C "
- MacNeill, Gibson 2C Greenock
- McKay, Daniel 1C Glasgow
- McMillan, Alex. 2C Greenock
- Munro, Geo. K. 2C Glasgow
- Murray, Ephrm. 2C "
- Norton, Thos. T. 1C "
- Parsons, Ths. G. 2C Leith
- Rapson, Red. R. 1C Falm'th
- Ritchie, Alex. 1C Leith
- Roberts, Robert 2C Cardiff
- Smith, Sydney 2C Liverpool
- Smith, Wm. W. 1C Leith
- Strathern, A. G. 1C Green'ck
- Stirling, David 2C Glasgow
- Thornton, Frncs 2C Cardiff
- Timpeon, Fk. R. 2C Glasgow
- Wallace, Wm. 1C N. Shields
- Walls, Wm. R. 2C Glasgow
- Weir, Wm. Hy. 1C "
- Wilkins, T. F. J. 1C Cardiff
- Wilson, Andrew 2C Liverpool
- Watts, John H. 2C London
- Wrate, Wm. J. 1C Leith

September 14th, 1889.

- Anday, Wm. 1C Liverpool
- Baker, Wm. 1C Hull
- Carr, Charles 1C London
- Carter, A. E. 2C London
- Clayton, Wm. 1C Cardiff
- Craig, Jas. 2C Dundee
- Dodsworth, J. W. 2C W. Hrtpl
- Duggleby, Chas. 2C Hull
- Fowler, J. H. 2C Hull
- Grenson, J. T. 2C London
- Hall, Thomas 2C W. Hrtpl
- Jones, Lewis 2C Cardiff
- Leitch, Andrew 1C Dundee
- Leonora, Joseph 1C Cardiff
- Manson, David 2C Liverpool
- Miller, Wm. 1C W. Hrtpl
- Norman, Jas. R. 2C London
- Patois, Geo. 1C London
- Peasacorda, J. W. 1C Liverpool
- Phillips, Wm. F. 2C Plymouth
- Pirie, Wm. 1C N. Shields
- Porpinatos, J. 2C Cardiff
- Savenije, C. H. J. 1C Liverpool
- Simmons, W. H. 2C London
- Smith, Matt. H. 1C N. Shields
- Stainton, Jn. L. 1C "
- Stevens, Thos. 1C Cardiff
- Tate, Thomas 2C N. Shields
- Truefitt, J. T. 2C "
- Walker, M. G. 1C W. Hrtpl
- Watson, Alex. 2C Liverpool
- Williams, S. M. 2C Cardiff

# The Marine Engineer.

LONDON, NOVEMBER 1, 1889.

**M**R. HENRY WEST, M.I.C.E., M.I.N.A., as President at the interesting meeting of the Liverpool Engineers' Society, delivered his inaugural address at the Royal Institution, Liverpool. The society seems flourishing, and the meeting was well attended.

The President proceeded to consider the progress which had been made in Naval Architecture and Shipbuilding from the earliest times up to the present day. After a glance at the first types of floating vessels, viz., the dug-out tree-trunk canoe, and the coracle, he drew attention to the fact that even in such very early instances the coracle embodied the same principles of construction as applied to modern vessels, viz., a combination of the longitudinal and transverse framing, so as to materially assist each other in the maintenance and the form of the boat covered with an outer covering, fulfilling the double duty of keeping out the water and binding the whole into a rigid structure. By a comparison, too, of the lines of the old Viking galley (recently unearthed) with these modern vessels, the similarity of methods was most noticeable, the frame supporting the side tier of planks, rivetted one to another and to the frame, is the nature of the old design employed in the Viking galley, and which represents a very rigid and strong method of construction.

When iron was first used in shipbuilding, the size and proportions of iron vessels at first remained pretty nearly the same as those current for wooden ships, but these proportions did not rule for long; it was found, from a cargo-carrying point of view, that for the most profitable form of hull, the length had to be continually increased as regards the beam until a limit was reached, owing to longitudinal weakness in a sea way. As, however, better distribution of the material is now being effected than in the infancy of iron steamboat building, and details are being worked out, it is probable, from the President's point of view, that a vessel might be made perfectly seaworthy even with greater relative and absolute length than as at present constructed.

Too much stability given to a vessel in the form of the hull has tended to cause labour and unusual straining in a cross sea. It was suggested that experimental tests of the position of the centre of

gravity of any vessel, by inclining the ship after loading, should be made, and the information so obtained, under various conditions of load, would probably provide valuable information to the owners. Naturally the constant demand at present is for the increase in the paying load of steamers, and this demand has been from time to time met in the following ways:—by increasing the ratio of the immersed and unimmersed portions of the vessel; by reducing the weight of the vessel itself; and by reducing the ratio of the fuel used to the cargo carried. Naturally this demand led in the first place to a heightened load line, until the agitation inaugurated by Mr. Plimsoll brought the matter under the notice of the Government, and led to the determination of a standard load line. A more scientific mode of meeting the demand is the reduction in the weight of the dead load of the ship, which has been done in various ways, and in the opinion of the President more may still be done if Lloyds' rules would allow suitable margin in the respective strength or proportion of parts according to the nature of the structure. It is no doubt difficult for such a reference body as Lloyds, to make serious modifications in their rules, except, at any rate, after due deliberation and the pressure of necessity; but Mr. West had no doubt that something would be gradually effected, as experience showed the advisability of changes. He considered that the proportion of weight of propeller-shaft, engine and boiler power, may still be considerably reduced. The consumption of coal per I.H.P. is reduced to nearly one-third since 1850 to 1855, and in the ships now being built the proportion of driving power to displacement is less than would apply to the same displacement divided over several vessels. The investigations of Professor Froude have practically established the nature of the resistance which a vessel offered in being driven through the water; it was found at low speeds that the resistance almost entirely consists of surface friction, so that within certain limits the influence of a ship's form was practically powerless to increase her resistance; as a consequence of these scientific facts a new class of steamers sprang readily into existence, which were built of steel, so as to be as light as possible. They had triple-expansion engines, which reduced their full load, they were of larger dimensions, and of fuller form, in virtue of which they were larger carriers without any considerable increase of resistance, at the speed for which they were

intended. We consider this summary of the progress and development of shipbuilding to have been well analysed and put together for the information of the Society.

MUCH attention is now being given to the value and construction of "ship railways." A large gathering of commercial and business men, particularly of those engaged in the shipping and carrying trade, met at the London Chamber of Commerce to hear an address by Mr. William Smith, M. I. C. E., as to "Ship Railways." The chairman, Mr. E. H. Carbutt, drew attention to the fact that a "ship railway" was now being built in Nova Scotia, and would join the Bay of Fundy with the Gulf of St. Lawrence. This is something of a test project. Should it prove successful other similar enterprises will probably follow at once. The Nova Scotian railway is 17 miles long, and for ships of 2,000 tons burden. The ships are lifted out at one end and run up a gradient of 1 in 500, and, after traversing the railway, are lifted in again. Mr. Smith, in reading his paper, pointed out the increased speed and cheapness of transit where the routes can be shortened, or water traffic connected by ship railways which will transport the vessel from water carriage to water carriage without breaking bulk or handling of cargoes. The general leading principle upon which ship railways are based is the distribution of the weight of the ship and car over a great number of wheels on parallel lines of rails, so as to reduce the pressure on the rails to such as an ordinary permanent way can carry. Another important principle is the distribution of the pressure uniformly over the whole ship and the flexibility of the car to adapt itself to the usual railway gradients and curves. These results have been obtained by the employment of hydraulic cushions, sectional cars with adjustable sides and compound bogies. The hydraulic cushions are a series of plain tubes of india-rubber and canvas passing under the ship's bottom, and resting on the car, the water pressure within the hydraulic cushions cannot exceed that due to the immersion of the ship, some 13 lbs. per square inch for the largest vessel afloat; thus the pressure on the interior of any cushion, when the weight of the vessel does not balance it, does not exceed a foot or two of head, the ship by its weight compressing the horizontal portions of the cushions and forcing the water up the vertical portions until the vessel is water-borne on the tubes. The car is built in segments, hinged together so as to

allow free vertical movement, and thus compensate to some extent for the inflexibility of the ship. The movement of the ship, though perfectly free, is a very slight move vertically. There is no horizontal movement on the cushions. The bogies, used for flexibility, are linked together end to end, but are capable of free movement to accommodate themselves to rail curves. At the end of the ship railway a submerged ship-way is built, the car is arranged by sections attached to each other, to suit the length of the ship to be carried, and the whole is run down under water until the car is below the bottom of the ship. To launch the vessel the ship is unfastened from the car as it approaches the bottom of the incline, and will rise off the cushions as it reaches the depth required for floating. As such a ship railway seems to be much cheaper in construction than any water way, this should prove excellent and economical means of communication between two water ways, and should effect a considerable economy in the carriage of goods. In this day of engineering marvels it would not surprise us very shortly to see several of these cheap ways carried into effect, and, we trust, running successfully.

THE peculiar and striking efficacy of oil as a pacific medium in storms at sea has again and again been proved in actual experience, and it is with good reason and great propriety that the framers of the Life-Saving Appliances Act, 1888, have included in the list of appliances forming the equipment with which lifeboats must be furnished, "one gallon of vegetable or animal oil in a vessel of an approved pattern for distributing it in the water in rough weather." The rules issued by the Board of Trade under the above-named Act, of which the foregoing sentence forms a part, come into force on 31st March next, and, doubtless, in a short time thereafter, as a result of the adoption of oil as a wave-pacifier for lifeboats, the system may give such a good account of itself that its employment on board large vessels will be absolutely compulsory. A fresh and interesting illustration of the force of the simile which speaks of "pouring oil on the troubled waters" has been afforded by the experience of the captain of a Dunkirk fishing vessel. Reporting to the Dunkirk Chamber of Commerce, under whose auspices systematic trials were made with oil on board the fleet of Dunkirk schooners engaged in the Iceland fisheries, Captain Bruxelles, of the schooner *Perle*, writes:—"On April 21, while off Portland, we encountered an

east-south-easterly gale, attended with snow. We endeavoured to stand out to sea with closely reefed sails, but were unable to clear the Wertman Islands. We then resolved to pass between these isles and the mainland. The tempest was then at its height, the sea was making a clean breast over the ship fore and aft, and we were in danger of foundering. I directed two bags containing tow saturated with oil to be placed astern on port and starboard quarter. Almost instantaneously the sea moderated, and although the swell was still heavy, no waves broke over the ship. I am in a position to state that a pint-and-a-half of oil per bag is sufficient to calm the sea for about two hours." Experience in this case, as in numerous others which have occurred very frequently within recent years, proves the efficiency and economy of using oil at sea. If the pacific influence of its use in stormy weather was more widely recognised, inventors would not be wanting who could devise methods for its convenient and efficient employment; but, as has been said, one may with reasonable certainty expect this result to flow from its compulsory use in the case of lifeboats subsequent to March 1890.

## INSTITUTE OF MARINE ENGINEERS.

A MEETING of the Institute of Marine Engineers was held in the premises occupied by the Institute, Langthorne Rooms, 17, Broadway, Stratford, on Tuesday evening, 24th September, presided over by Mr. J. McFARLANE GRAY (Vice-President) Chief Examiner of Engineers, Board of Trade.

Mr. BRUCE (member) read a paper on "Radial Valve Gear," with special reference to Morton's improvements of recent date. The paper was illustrated by a large number of excellent diagrams and several working models, one of these latter showing the valve gear in all its details with valve, piston and crank motions.

The author briefly referred to the various older gears of a character similar to Morton's, and proceeded to point out the details with the motions peculiar to each.

In adopting the radial system of valve gear, it was shown that a shorter crank shaft without shortening the bearings, much less weight of engine, and a more compact engine-room is required as compared with the ordinary eccentric and link motion. The gain to the shipowner being more cargo-carrying capacity for the same power of propelling machinery, along with less deadweight, involving less expenditure of coal.

Messrs. Marshall and R. L. Weighton (Hawthorn, Leslie & Co., Newcastle) were quoted by Mr. Bruce as having, in a paper read before the North-East Coast Association of Engineers, referred to the average weight of engine (including all the propelling portion of the machinery), and basing his calculations upon this and on the data furnished him by Messrs. Barclay, Curle & Co., in connection with the s.s. *Circe*, engined by that firm, he considered that the saving in weight by the adoption of radial valve gear was at least 10 per cent.

The greater comfort and ease of mind enjoyed by the engineer in charge of engines fitted with radial valve gear was also referred to, inasmuch as the eccentrics were entirely dispensed with. Eccentrics and their connections being frequently a source of worry and anxiety at sea and of hard work in port overhauling and refitting the liners and parting pieces.

The discussion was opened and maintained by Messrs. Rowe, Adamson (Hon. Sec.), J. H. Thomson, R. Leslie, and J. Haw-

thorn, dealing with the questions of engine-room space, length of crank shaft, weight of engines, number of working parts, motion of the valves for opening and cut-off, lead of valve at various parts of the stroke, with full steam and early cut-off, in the various types of valve gear, including Hackworth's & Joy's.

Mr. McFARLANE GRAY illustrated on the black board the rudimentary principles in all forms of valve motion, pointing out the aims of all those who sought to invent a perfect valve gear, whether radial or other. He questioned the author of the paper very closely as to the object of having earlier port opening on the bottom, and on several other matters of detail in connection with the gear under discussion. Mr. BRUCE replied very readily to the questions put before him, and the proceedings closed by a vote of thanks to the author, proposed by Mr. Leslie and seconded by Mr. Thorburn, and to the chairman proposed by Mr. Roberts (Superintendent Engineer, "Glen Line"), these were heartily accorded.

On the motion of the Hon. Secretary, the discussion was arranged to be continued on Friday, 27th September.

It was intimated that a handsome model with movable parts, showing the gear and valve and piston in relative positions, had been presented to the Institute by the proprietors of the Morton gear.

An adjourned meeting of the Institute of Marine Engineers was held in the Langthorne Rooms, 17, Broadway, Stratford, on Friday evening, 27th September, at 7.30 p.m., presided over by Mr. J. McFARLANE GRAY, when the discussion on Radial Valve Gear was continued from Tuesday, 24th September.

The CHAIRMAN referred to the several questions which were partly discussed at the previous meeting, and as Mr. Joy was present, he would ask him to give a description of his gear, or, as the meeting was called for the purpose of instruction, if he could give any information of a useful or interesting character, as no doubt he could, regarding his own design of gear, such would be much appreciated. Before asking Mr. Joy to speak, the claims advanced by Mr. Bruce at last meeting, in favour of radial valve gear as compared with the ordinary eccentric gear, were pointed out: (1) less weight of engine; (2) shorter engine room, involving more cargo space and less displacement; (3) a better steam admission; (4) a more perfect distribution of steam, both in the go-ahead and go-astern gear. Most, but not all, of these improvements are found in the older forms of radial gear as well as in Morton's. Great credit is due to Mr. Joy for what he did in bringing to a practical issue the ideas which were floating about regarding radial gear many years ago.

Mr. JOY, in response to the invitation, expressed his regret that he had not been present at the previous meeting to hear the paper read—owing to detention at a trial trip—and he was not, therefore, in a position to take much part in the discussion. He had brought a few diagrams at a venture to illustrate a few remarks he might make on radial valve gear. The gear which he had been instrumental in bringing out, and which was now largely in use both in marine engines and locomotives, was the outcome of his endeavour to bring the engines into a more compact form by keeping the cylinder covers close together and placing the valves out of the centre line, thus saving fore-and-aft space. Mr. JOY stated that some of the locomotives fitted with this style of gear run 19 miles in 17 minutes during periods of their journeys, and nearly 1,000 engines have been fitted with it, which is quite a sufficient guarantee of the success of radial valve gear as designed by him.

Several diagrams were exhibited by Mr. JOY to illustrate the application of, and results from, his own gear, as fitted both to marine and land engines.

Mr. ROBERTS spoke in favour of the radial valve gear which is fitted in one or two of the Glen Line steamers on Mr. JOY's principle.

Several members engaged in the discussion, pointing out the probable and possible advantages as well as the disadvantages of the gear. Mr. JOY and Mr. BRUCE replied to the various questions which had been raised during the evening, and the general impression seemed to be that valve gear of the radial type is an improvement on the ordinary eccentric gear. Amongst the interesting statements made by Mr. JOY, there was one to the effect that the coal consumption and mileage run by locomotives was very carefully and minutely recorded; so much so, that in some of the Midland Railway engines the placing in order of economy—judged from a comparative analysis—hinged upon the figures in the 2nd or 3rd place of decimals.

The discussion was continued with considerable vigour, and much information was elicited, the whole tending very greatly to the improvement and benefit of those who were present to hear the proceedings and see the illustrations.

Votes of thanks were heartily accorded to Mr. Joy, Mr. Bruce, and the Chairman, and were duly responded to.

## ELECTRICITY IN THE ENGINE ROOM.

By FREDERICK WALKER, M.S.E.

II.

**T**HE requirements of electrical illumination on passenger steamers are generally limited to the lighting of the saloons, state-rooms and cabins by incandescence lamps; other lamps, of special construction, for use in the holds while working cargo and the like; an electric projector or search light; and midship lamp for the navigation by night of the Suez Canal.

The generating plant usually comprises one or two sets of high-speed steam-engines, either coupled directly to the spindles of the dynamo electric generators driven by them, or by the interposition of frictional, rope-driving, or similar gearing for the purpose of enabling the engine to work at a lower rate of speed.

The dynamo machines may be of the kind generally known as "series," "shunt," "compound or regulating," or "separately excited," the four definitions relating to different methods of producing the magnetic field. A "series dynamo" may be briefly described as one in which the whole of the current generated passes round the coils of the field magnets, these being included in the circuit.

As incandescence lamps are generally arranged in what is known as "parallel," or "multiple arc" it is evident that an additional lamp placed in the circuit in this way, must reduce the total resistance, although demanding more current, and since the coils of the field magnet form, as it were, a part of the main leads, it is evident that, within a certain limit, the increase of current may be generated by the machine.

This type of machine, although capable of being regulated by careful management and by the employment of artificial resistances, is not to be recommended for an installation of the kind forming the subject of these papers. The carbon filament of an incandescence or glow lamp is too fragile to admit of the passage of a greater current than is sufficient to render it incandescent, therefore, a constant electromotive force at the terminals of the main leads, irrespective of the number of lamps that are switched into the circuit, is highly essential. This has not yet been brought to absolute perfection, but methods have been devised whereby the electromotive force is maintained approximately steady, although several lamps may be suddenly switched in or out of the circuit.

A "shunt wound" machine is one in which the field magnets are wound with fine wire, of high resistance, the ends of which are coupled to the two brushes, so that the magnetizing coils actually form a "shunt" to the main circuit. The current producing the magnetic field is small in proportion to that passing round the main circuit, owing to the high resistance of the "shunt," and the fact of increasing the external resistance causes more current to flow round the field, and thereby augment the magnetic effect. This type of machine is better suited to a circuit in which the lamps are arranged in "series," and although to some extent it acts as a regulating dynamo, it is extremely sensitive to any fluctuations in the rate of speed at which it is driven.

The "compound" wound dynamo may briefly be described as a combination of the "shunt" and "series" systems, one set of layers forming the magnetizing coils of the field, being arranged in "series," and a second set of layers, of finer wire, being placed as a shunt, either across the brushes or the terminals of the main circuit. If the magnetizing effect of the latter predominates, the current will be practically of uniform strength, but if the "series" coils are arranged so as to exert the greatest influence upon the field, the electromotive force will be approximately constant. This system is found to work satisfactorily in practice, and is generally adopted, but a certain rate of speed must be uniformly maintained. A "tachometer," or "speed gauge," attached to the spindle of the dynamo, or driven by it, enables the attendant to keep the speed practically constant; but no system of this kind can be perfect in which the constant close attention of a man in charge is demanded; therefore it is highly desirable to employ an

automatic electric governor, or regulator, by means of which the throttle valve may be controlled by an electro-magnet, or a solenoid, placed as a shunt to the main circuit. This arrangement causes the engine to be regulated automatically, according to the requirements of the electrical portion of the installation, and, to some extent, dispenses with the necessity for constant watchfulness on the part of the attendant.

A "separately excited" dynamo possesses all the advantages of the foregoing type, the field being simply magnetized by a current generated by a small dynamo, the armature of which is driven by the same mechanism employed to actuate that of the larger one.

The electromotive force is thus rendered constant, relatively to alterations of the resistance of the main circuit, caused by the switching-lamps in or out, but yet is subservient to the rate of speed of the engine.

From an engineering point of view, a dynamo is a very simple machine, possessing but three wearing surfaces, the two end bearings or journals, and the commutator. As a very small amount of clearance between the periphery of the armature and the bore of the field magnet-poles is essential for efficient working, it is necessary that the wear of the bearings or journals shall be as little as possible. This is effected by the employment of long bearings, and also by the careful adjustment of the driving-gear so as to minimise the angular strain, not to exceed the point that is actually requisite for the transmission of power from the prime motor. The commutator, however, is a different matter, and is subject to other causes of deterioration beyond the actual contact and consequent friction of the brushes.

When, however, a dynamo-machine is properly designed, and the conditions of working are favourable, the wear of the commutator should not exceed that caused by the friction of the brushes, because no sparking should take place. When we consider that a so-called electric spark is invariably particles of matter rendered incandescent by the passage of the current, the rapid wearing of a commutator that is allowed to spark is easily understood. An interesting experiment once performed by the writer, will, if repeated, illustrate the above fact. Two polished wires, connected to the terminals of a single Bunsen cell, were arranged upon the stage of a microscope in such a manner as to be perfectly insulated from each other, while a thumb-screw of fine pitch enabled the points of the wires to be advanced or receded with respect to each other. Although as stated, the wires were highly polished, the surfaces of the points appeared to be extremely rough and uneven when viewed through the instrument. Adjusting the wires so that the point of contact was within the field of vision, and appeared to be actually touching to the naked eye, the screw above mentioned was carefully turned so as to bring the wires into actual contact. Before this took place, a blister appeared to form upon the surface of the positive wire, which suddenly became detached, and momentarily incandescent, and then was distinctly observed to be attached to the negative wire, in an inverted position resembling a small bowl. This phenomenon, viewed by the naked eye, would simply have appeared as a spark, caused by touching the negative wire by the point of the positive. As a matter of fact, although the distance intervening was really infinitely small, contact did not take place between the two wires. This experiment, however, serves to corroborate the theory that all sparking arising from apparent metallic contact, is actually the result of disintegration of the surfaces.

If the dynamo is not properly proportioned to the work it has to do, or is generally of bad design, it is impossible to eliminate sparking at the commutator by any adjustment of the brushes; but in a good machine the proper angle of commutation, or, as it is sometimes termed, "lead" of the brushes, may easily be ascertained. The brushes must make good contact with the bars of the commutator that correspond to the neutral point of the armature; and as an adjustable brush-holder is generally provided, such adjustment may conveniently be performed. If the "lead" of the brushes is not sufficient, a stream of particles torn from both the surface of the commutator and also the brushes, maintains as it were the proper "lead" by an arc; and the same result occurs from underneath the brushes when the "lead" given is too much. In addition to the rapid deterioration of the commutator, the efficiency of the machine is greatly impaired by the introduction of the extra resistance of the metallic arc before mentioned. If a commutator be allowed to become deeply grooved, or out of truth, it is impossible to avoid sparking, however

accurately the "lead" may be adjusted, and then it is that the wonderful and complicated arrangements of string and wire, sometimes seen attached to the brushes, are resorted to, with a view to prevent sparking by increasing the tension of the spring contacts. This is such a poor and inefficient makeshift that it is far better to rig up a hand rest, and true up the surface of the commutator by means of a sharp graver, and finishing off with a smooth file. The insulation should never be scraped longitudinally, as the grooves so formed allow particles of metal to cohere, and partially short-circuit the bars. Brushes formed of layers of thin rolled brass plate are better in practice than those made of wire, but the best of all consists of alternate layers of wire gauze and graphite or plumbago, compressed so as to firmly adhere to the meshes. In this case no lubrication is required, which, when oil is used, is always a source of trouble. A certain amount of end play, or traverse between the collars of the journals of the armature spindle is advantageous, as it tends to prevent grooving by varying the surface of the commutator acted upon by the brushes.

The leads, or main wires, for conducting the current from the dynamo to the lamps should be of sufficient size, so that it is not appreciably raised in temperature by the passage of the normal current, and should be well insulated throughout. The hull of the ship should never be used as part of the electrical circuit, for although, by the adoption of this method, the first cost of the installation is reduced, it is far from true economy in the end. There is no such thing in nature as a perfect non-conductor of electricity, the best of insulating material can only be defined as a bad conductor, by the use of which the leakage between the higher and lower potentials of an electric circuit may be rendered so small as to be negligible. If the metallic structure of the vessel be utilised in order to save one "lead" or "main," it is evident that the insulation of the circuit is limited to the thickness of that surrounding the single cable.

Insufficient insulation is a frequent source of failure in shore installations, but at sea the danger is intensified by reason of the prevailing dampness, liability to impregnation of the insulation with saline matter, and the never-ceasing movement which slowly but surely abrades the covering of the cable at every point where it is rigidly secured. Wherever leakage occurs, electro-chemical action is set up, tending to the increase of the leakage and destruction of the metals in partial contact. Therefore, in order to render a marine installation as perfect and as safe as human foresight can provide for, no part of the hull of the ship should be in metallic contact with, or form part of, the electrical circuit. A good "cut out" or "fusible bridge" should be inserted in the main circuit, as close to the dynamo machine as possible, and the fusing point should, in a 200-light installation, be kept within 20 amperes beyond the proper current required for all the lamps. It is a reprehensible practice to put thicker metal in the clamps of the cut out than is absolutely required for the fulfilment of the above conditions, and is analogous to the equally bad one generally attributed to the engineers of American river steamers, namely, loading the safety-valves. In both cases, the objects sought to be attained by the employment of safety devices is entirely defeated, and, as far as usefulness is concerned, these may be removed. The main "cut out" should be duplicated, and provided with a switch lever for switching the current through the uninjured bridge, while the other is replaced; after, of course, the short circuit, or other cause of the increase of current has been localised and remedied. Each branch, or sub-circuit, leading to more than two lamps, should be provided with a single "cut out," suitable to the current carried.

All switches and contacts should be sufficiently massive, and present a large surface for contact, so as to prevent heating and loss of power, and it should be borne in mind that the remarks in a former paragraph respecting sparking are equally applicable in this case.

We may assume, for all practical purposes, that the absorption of energy in an installation of incandescence or glow lamps is at the rate of 4 watts per candle; therefore, where 16 c.p. lamps are used throughout,  $64 \times n = \text{total electrical energy absorbed in lighting, neglecting the waste in the leads, dynamo, \&c.}$  In the case of a 200-light installation, the result would be

$$200 \times 64 = 12,800 \text{ watts,}$$

and allowing for the waste, this would require a machine giving an output of 13 kilo-watts, with a potential between the terminals of the circuit of 100, 80, or 60 volts, according to the type of lamps employed. Generally, a double set of dynamos

and engines are provided, so as to supply two distinct circuits, enabling one set to be used for supplying current to the projector and midship lamp while passing through the Suez Canal. The requirements of these latter appliances are, in the case of the projector, a current of from 45 to 50 amperes, at a potential of from 70 to 80 volts, and the midship lamp, which is coupled in parallel or multiple arc, from about 20 to 25 amperes. If the electromotive force at the terminals of the dynamo is in excess of that required for the projector and midship lamp, a resistance frame may be interposed, which, being permanently fitted up in the engine-room as part of the projector circuit, need not in any way interfere with the working of the rest of the installation.

The above brief notes upon ordinary marine installations may serve to give a general idea of the power required for the efficient lighting of a large passenger steamer, therefore a few words upon the effect of the electric current upon the human body, and the danger to life, may be opportune at this period.

Many experiments have been carried out, especially since the passing of the new Act in the United States, sanctioning the execution of criminals by electricity, in order to ascertain the exact current that will cause death, when passed through the human body. The conclusive phenomena could, of course, only be tested by experiments upon animals, which does not admit of an accurate estimation of the current necessary to be fatal to mankind. Yet, the investigations that have been made respecting the conditions under which the electric current has at times caused death, and also the careful measurements of the resistance of the human body, although without defining a mean value, have enabled us to approximately fix a limit of safety.

The electrical resistance of the human body depends upon the thickness or state of the skin, and varies between the hands from 10,000 to 4,000 ohms. If we assume, for safety, that 0.25 ampere will be dangerous to life, in the first case the difference of potential is 2,500 volts, and in the second case 1,000 volts, in which the act of placing the body as a shunt in the circuit may be attended with a fatal result. Considering that the resistance of different persons varies greatly, and that when the hands, or other parts of the body is soaked for some time in salt-water, the resistance of the skin is much lower than when it is dry; we may state that when the potential between any two points of a circuit is greater than 700 volts, it is dangerous to close the circuit with the body, or to interpose it as a shunt. The constitution of the person has also to be taken into account, for with a predisposition to heart disease, or aneurism, a much lower electromotive force may be fatal; but it may be generally accepted as a fact that the shock from accidentally making contact with any ordinary continuous current incandescence installation is quite harmless.

I have hitherto dealt only with the use of a continuous current, but may at a future time give some particulars relating to alternating currents and the application of this system to marine installations.

There exists no scientific reason why the electric light should not be as reliable as any other system of lighting, and be equally applicable to the side lights, head lights, and binnacle lights of a ship, as those in general use, and if the electric light has acquired notoriety as a light that cannot be depended upon, the fault rests solely with those who from ignorance or motives of false economy plan and fit up an inefficient and untrustworthy installation, or those who wilfully or negligently allow a good installation to deteriorate, and consequently fail in maintenance. The day is not far distant when both these sources of failure will be eliminated, for the rapid advance of science, and also the keen competition that obtains in commerce, demands the faithful fulfilment of that which is possible.

## FORCED DRAUGHT.

A MEETING of the Institute of Marine Engineers was held on Saturday evening, 19th October, in the Langthorne Rooms, Broadway, Stratford, presided over by Mr. James Adamson (Hon. Secretary), when Mr. Joseph Williams read a very exhaustive and carefully prepared paper on the subject of "Forced Draught."

The Chairman introduced Mr. Williams as a member of the Institute, who had come from Birmingham in order to read the paper he had prepared, a proof of the interest he had in

the Institute. Mr. Williams began his paper by commenting briefly on the several systems of forced draught which have been tried—the steam jet and induced draught, cold blast, hot blast, and the closed stokehold. The first of these was not further referred to, as being inapplicable to marine boilers, considered in relation to the various questions necessarily involved, especially in these days of high pressure; at the same time it may be held that other appliances besides the steam jet are available for induced draught, as by an exhaust fan or other appliance, and it may be worth further investigation, as this system has much to recommend it. The Ferrando system, which is in use in many steamers in America and in several which have been built for the Italian Government, the air being supplied under pressure to the ash pits: of this system there are many modifications and claimants for various minor improvements. The objections to the cold blast and the closed stokehold are many and grave. Some of these are capable of removal by arrangements to counteract them; but, taking into consideration the “human factor,” the closed stokehold system is not the best.

The introduction of cold air into the fire boxes through the furnaces when cleaning the fires has been partly overcome in the *City of Paris* by having dampers fitted in the smoke boxes; but here it comes to be almost a necessity—to ensure the firemen attending to the use of the dampers—to have an engineer standing by to see that the dampers are closed, and thus minimise the amount of cold air admitted to the back ends of the furnaces when the fires are being cleaned. The heating of the air before being introduced to the furnaces was considered by the author of the paper to be the best he had seen; and he had seen or had experience of many steamers fitted and sailing in many parts of the world with “forced draught,” and applied with various results. In some cases of perverted ingenuity the amount of coal consumed was increased, and at the same time the vessel was driven at a less rate of speed with forced than with natural draught. In his experience he had found that the system introduced by Mr. James Howden had given excellent results, where attention had been paid to the details of working the system, and common sense and discretion had not been wanting on the part of those in charge. Some very interesting and valuable data were given from personal observations, indicative not only of the excellent results which have been gained from the use of “forced draught,” but of the care and attention bestowed upon the apparent trifles which go to make, when summed up, the success or non-success of any system. A table showing the gain in space by the adoption of “forced draught” and new engines was given by Mr. Williams, taken from actual measurement, as follows:—

NAME OF STEAMER.	Dimensions.	Machinery and Boiler space.		H.P. before refit.	H.P. after refit.
		After refit.	Reductn. After refit.		
City of Venice	379x38x29	68ft.	12ft.	28	1350
Ohio .. ..	343x43x34-6	70 „	16 „	26	1850
Austrian ..	319x38 5x32-5	45 „	28-6	54	1150
City of Canterbury ..	379x38x29	64 „	10ft.	37	1350
Illinois .. ..	343x43x34-6	64 „	22 „	38	1850
Sarmatian ..	370x42x35-6	49 „	75 „	63	2000
Indiana .. ..	343x43x34-6	44 „	42 „	67	1850
Clan Gordon ..	3056x34-9x24	—	—	28	750

The animated discussion which ensued was sustained by Messrs. J. W. Richardson, J. W. Ruthven, J. Mc. F. Gray, Sage, R. Bruce, Smith, Coubro, Hawthorn, and others, in the course of which the advantages of forced draught were considered, and the objections to its introduction were brought forward. The *New York City* and *City of Venice* were frequently referred to as examples of Mr. Howden's system, where a considerable saving of fuel had been effected without any bad results to the boilers on account of the blast. Several cases were cited, where by want of attention to details, faulty design of boilers, or defective arrangement of forced draught, bad results ensued. In summing up, the Chairman, after commenting on the results obtained and condition of the boilers of the *New York City* and *City of Venice*, which he had carefully inspected on two occasions, expressed his opinion that Mr. Howden's system was on the right lines and that, with some

improvements and boilers constructed to meet the conditions of forced draught, its introduction generally would be accepted without question. Improvements were required in driving the fan. The style of fan and the whole arrangement both as regards position and delivery of air was referred to by several members in the course of the discussion.

The meeting closed with the usual votes of thanks to the author of the paper and the Chairman, moved and seconded by Messrs. J. Mc. F. Gray and J. R. Ruthven, and L. B. Coubro and W. J. Craig.

The next paper would be read by Mr. A. Beldam, on Friday, 1st November, on the Progress and Development of the Marine Engine.

## THE PARIS EXHIBITION, 1889.

### NAVAL ARCHITECTURE & MARINE ENGINEERING

#### II.—Tyneside Firms.

(Continued from page 258.)

ANOTHER specially interesting model is that of the steel torpedo gunboat for the Austrian Government, now rapidly approaching completion, at the Jarrow yard of Palmer's Shipbuilding & Iron Co., Limited. The speed and dimensions of this vessel calls to mind the *El Destructor*, built on the Clyde for the Spanish Government; and we anticipate the Austrian vessel will be her rival in speed if not in destructive capabilities. The displacement of each of these vessels is almost identical, *El Destructor* being 458 tons, and the Austrian torpedo gunboat, building at Jarrow, 480 tons. The dimensions of the latter are more favourable to high speed, both as to the length, 210 ft., and beam, 23 ft., *El Destructor* having a length of only 192 ft. 6 in., and a more excessive beam, 25 ft. The estimated power of the engines of the vessel building by Palmer's Shipbuilding & Iron Co., Limited, is 3,500 I.H.P., but this will probably be exceeded; while in Lord Brassey's “Naval Annual” the power of the engines of *El Destructor* is given as 3,800 I.H.P. The mean speed of the latter vessel with two runs, each of three hours' duration, was 22-56 knots; and as a mean speed at sea of 20 knots is anticipated for the Austrian torpedo gunboat, it is more than possible that the *El Destructor's* trial results will be exceeded. Looking at the model of the Austrian torpedo gunboat building on the Tyne, a noteworthy feature is the large extent to which the deadwood is cut away both forward and aft, and advantage of the free-water space so gained at the after end of the vessel has been taken by extending the rudder to a considerable distance below the hull proper, forward of the rudder post, so largely increasing the area of the rudder and the manœuvring capabilities of the vessel. The offensive powers of this craft are also considerable, as besides torpedo tubes, bow and stern chaser guns of the rapid-firing type of moderately-large calibre are being provided, besides eight lighter guns of smaller description on the broadsides. No less than ten boats are carried by this vessel, including two constructed of steel, and the vessel appears to be well adapted for carrying out rapidly, and probably before the enemy are aware of its approach, the capture of small ports not accessible to large vessels, besides being of considerable use in various other directions.

Amongst a large number of photographs with which the stand of Palmer's Shipbuilding & Iron Co., Limited, is embellished are a number illustrative of H.M.S. *Orlando* and *Undaunted*, including several instantaneous ones representing these vessels at the time of being launched, showing the vessels ready for entering their “native element;” in the act of taking the water; and afloat. As, however, these vessels have frequently been referred to in our columns on previous occasions, a further allusion is not now requisite. A number of instantaneous photographs of H.M.S. *Surprise* and *Alacrity*, built by Palmer's Shipbuilding & Iron Co., Limited, about four years ago, are also to be seen, as well as a completely furnished full model of these vessels. *En passant* it may be noted that the *Surprise* and *Alacrity* were built for despatch purposes, are 250 ft. in length, 32 ft. 6 in. beam, 20 ft. depth of hold, and on their speed trials attained 18½ knots with 3,017 I.H.P. They are equipped with four 5-inch breach-loading guns, four rapid-firing and two machine guns, besides a torpedo launching carriage. The total cost of each vessel, including gun mountings and propelling machinery was upwards of £78,000.

There is yet another model exhibited by Palmer's Shipbuilding & Iron Co., Limited, of the "war vessel" class, viz., one of a proposed steel twin-screw torpedo boat, with engines of the vertical triple-expansion type, to indicate 2,000 H.P. at a speed under forced draught of 22 knots per hour. It would undoubtedly be an advantage to the British Admiralty, in the event of war breaking out, if there were more than two or three firms experienced in building fast torpedo boats, besides, on commercial grounds it would also be advantageous to have increased competition for this class of work. Probably also with an enlarged area of torpedo boat production, we should also hear of fewer casualties and breakdowns, so that altogether it would be a wise policy if, as in the larger classes of British Government vessels, there was more open competition.

Turning from war-vessels to ordinary mercantile steamers, a model of another proposed steamer, designed by Palmer's Shipbuilding & Iron Co., Limited, meets our view, viz., an Atlantic liner, stated by the representative of the company at the exhibition, to have been constructed this year from designs of a vessel which, if built, would cross the Atlantic between Queens-town and New York in five days. As besides the dimensions—which are—length, perpendiculars, 450 ft.; breadth, 54 ft.; depth, 38 ft.—there are no particulars, such as engine power, &c., given, it is impossible to pass any criticism upon the design so far as to its proposed speed; but so far as the modelling of the hull is concerned, the general design appears satisfactory.

There are yet other six models of mercantile vessels built by this company to be referred to. Two of these we saw at the Newcastle-on-Tyne Exhibition of 1887, viz., one of the oil-in-bulk steamers, *Acmé and Era*, and one of the improved well-deckers, *W. J. Radcliffe*, and described them at some length on page 129 of vol. ix. of the MARINE ENGINEER. The remaining models we now briefly refer to. Three of these represent steam vessels built during last year, of the deadweight carrying type, but above the average speed of ordinary vessels of this class, viz., the *Locksley Hall*, of 5,800 tons displacement, constructed of steel, and having apparently a cast steel rudder. This vessel is 330 ft. in length, perpendiculars, 45 ft. beam, 30 ft. 3 in. depth of hold, and has triple-expansion engines of 2,100 I.H.P., driving the vessel at an average speed of 11 knots at sea. The other vessels built in 1888, of each of which a model is shown, are apparently sister vessels built off the same lines, and are the s.s. *Loch Lomond* and the s.s. *Rosemorran*, both of 4,070 tons displacement, and of the following dimensions:—Length, perpendicular, 312 ft.; breadth, 40 ft.; depth of hold, 27 ft. 6 in., having full poops, hurricane or bridge houses, and topgallant forecastles. These vessels are credited with a speed of 10 knots at sea, have triple-expansion engines, and are built of steel.

The last model of a steam vessel to be noted on this stand is that of the steel screw steamer *Atalanta*, built during the present year for Messrs. John E. Kerr & Co.'s line of fruit and passenger steamers, between Jamaica and New York. The vessel is of the following dimensions:—Length, 235 ft.; breadth, 31 ft. 6 in.; depth of hold, 22 ft., and is of the well-deck type, but provided with deck houses for passengers entrances, smoke rooms, &c., &c. This vessel is of special fine design, having only a deadweight capacity of 650 tons, and as the engine power provided is 3,000 I.H.P., it is not surprising the vessel's speed is, for vessels of this type, considerable, it being stated to average 17 knots at sea. Considering the small cargo carried, there is ample provision for rapid loading and discharging, part of it consisting of three steam winches, viz., one to each of the cargo hatches.

Besides the photographs we have already singled out for notice, and which if our time and space permitted might each have been particularised, those giving general and part views of the works at Jarrow, one of these showing the crowds of workmen leaving work at the shipyard department, and one of the full-rigged ship, *Fair Winds*, built for Messrs. E. N. Gardner & Co., Liverpool, are of particular interest to visitors as giving some idea of the industrial activity of this Tyneside concern, and showing that in shipbuilding it is as equally at home in sailing as in steam vessels. There are also shown on the stand several awards of merit, received by Palmer's Shipbuilding & Iron Co., Limited, including a Bronze Medal at the 1878 Paris Exhibition, a Diploma d'Honneur from the 1885 Exposition du Travail at Paris, a Gold Medal at the Liverpool Exhibition of 1886, and likewise a Gold Medal received for their exhibits at the Newcastle-on-Tyne Exhibition in 1887.

Marine engineering is also directly represented by this company at the present exhibition by the model of the s.s. *Flamborough's* engines, which were specially constructed for the Newcastle-on-Tyne Exhibition. As we fully illustrated and described these engines in our July, 1887, number (see pages 130 and 131 of volume ix.), it will be sufficient to state that the model represents the ordinary type of triple-expansion engine as constructed by Palmer's Shipbuilding & Iron Co., Limited, for mercantile steamers. It is to be regretted that owing to the absence of steam supply in the gallery of the Palace des Machines this exhibit is not to be seen at work.

Illustrative of the iron and steel manufacturing departments of the company, there are models of the blast furnaces at Jarrow, besides specimens of raw and manufactured iron and steel, including a large number of tests and of various sections, e.g., butterley bulbs, coaming bars, Z and ordinary T, and angle bars. Of some interest, as giving a graphic idea of the manufacture of pig-iron, is the arrangement of one part of their stand. Here we see a piece of Cleveland ironstone, 7 lbs. weight. Again we see a piece of calcined Cleveland ironstone, 5 lbs. weight; the loss due to this process being represented by the difference between these weights. Along with the last mentioned there is placed 2 lbs. of coke and 1 lb. of limestone, so that together there are 8 lbs., these quantities showing the proportions of the materials with which the blast furnaces are charged. Next we see 2 lbs. of pig iron and 3 lbs. of slag, the resultant of the treatment of 5 lbs. of calcined ore in the blast furnace.

Messrs. C. S. Swan & Hunter, of Wallsend, is the remaining Tyneside firm of shipbuilders and engineers represented at the Paris Exhibition, and here again we find a paucity of exhibits. Besides a number of photographs, the firm have been content to only exhibit three models, but as they are illustrative of different types of vessels, this in some measure compensates for their scarcity. The smallest vessel represented is the coasting steamer, *Paris*, recently built for E. Hashehurst, Esq., of London. This vessel is 162 ft. in length, 25 ft. in extreme breadth, and 9 ft. 9 in. depth of hold, and is constructed of Siemens-Martin steel. The engines are of the triple-expansion type, indicating 358 H.P., 13½ in., 22 in., and 36 in. clear of cylinders, 24 in. stroke, and the boiler has a working pressure of 150 lbs. per square inch.

The twin screw steamer, *Courier*, built for trading in the Australasian seas, is the second vessel of which Messrs. C. S. Swan & Hunter exhibit a model. This vessel has specially fine lines, being engaged in carrying passengers as well as cargo, and is constructed of steel. The principal dimensions are:—Length, perpendiculars, 220 ft.; breadth, 30 ft.; depth of hold, 13 ft. 3 in. As in all the vessels of which this Wallsend firm exhibit models, the engines are of the triple-expansion type, the cylinders being 30 in., 46 in., and 73 in. clear, 36 in. length of stroke, and the working pressure of the boilers 150 lbs. per square inch. The aggregate indicated H.P. of the two sets of engines is 2,980, with which power a very high speed is attained.

The remaining vessel represented by a model is the screw steamer, *Elingamite*, built for the same owners as the *Courier*, but a larger class of vessel. The principal dimensions are:—Length, perpendiculars, 310 ft. 6 in.; breadth, moulded, 40 ft. 10 in.; depth of hold, 22 ft. 2 in., similar in construction to the *Coragamite*, of which a model was exhibited at Newcastle-on-Tyne, a detailed description is not necessary. Although, as we have already noted, Messrs. C. S. Swan & Hunter's exhibits are few in number, they display excellence in design, for which this firm has a well-established name.

## THE SHORT STEAMSHIP SERVICE TO IRELAND.

CONSIDERING that the voyage from Stranraer to Larne is by far the shortest between Great Britain and Ireland, and as there are a vast number of persons who dread making voyages, even for very short distances, when the sea is rough, it is not surprising that the steamship service in this short passage has been a great success, and is likely to greatly progress in prosperity in the near future.

The present steamship service between Stranraer and Larne, belonging to the Larne and Stranraer Steamboat Co., Limited, commenced in July, 1872. The steamers now owned by the company are the *Princess Louise* and *Princess Beatrice*. The

former-named steamer is used as a spare boat, while the latter performs the daily service (Sundays excepted). She starts from Stranraer for Larne in the morning, and returns in the evening at the hours subsequently mentioned in connection with express trains to and from all parts on both sides of the Channel.

The *Princess Louise* is a paddle steamer built by Messrs. Tod & McGregor, of Glasgow, in 1872. Her dimensions are:—Length, 211 ft. 4 in.; breadth, 24 ft. 15 in.; depth, 12 ft. 6 in.; and speed, 13 knots. She is certified to carry 497 passengers. Her gross tonnage is 497, and her net tonnage 235. Her engines, which are ordinary surface condensing, have two cylinders each of which is 56 in. in diameter, and the stroke is 60 in. She is provided with four single-ended boilers, which have a pressure of 40 lbs. to the square inch.

The *Princess Beatrice* is also a paddle steamer, and was built by Messrs. Harland & Wolf, of Belfast, in 1875. She has a length of 234 ft. 6 in., a breadth of 24 ft., and a depth of 12 ft. 6 in. Her speed is 14 knots, and her gross tonnage 560, and her net tonnage 256. She is certified to carry 550 passengers. Her engines are compound with cylinders of 49 and 72 in. diameter and 72 in. stroke. They are worked from two double-ended boilers, with a pressure of 100 lbs. to the square inch.

The importance of the service has so improved recently, that a new paddle steamer has been ordered, and is now being built by Messrs. W. Denny & Brothers, of Dumbarton. It is expected that it will be ready for the service next January. Her dimensions will be 280 ft. in length, 35 ft. 6 in. in breadth, and 14 ft. in depth. Her gross tonnage will be about 1,100, and she will be fitted with very powerful engines, which will indicate no less than 4,000 H.P., whereby she can be propelled at least 19 knots an hour, at which rate she will probably be driven in accordance with the general wish to increase the speed of all cross-Channel steamers. It is reasonably expected that this coming steamer will make the voyage from port to port in two hours, which at present is performed by the *Princess Beatrice* in 2½ hours. Passengers will thus be able to arrive in Belfast from Stranraer as soon as they now arrive from the latter place at Larne. This will be a very appreciable saving of time to travellers to and from the North of Ireland.

As regards the express train service in connection with the voyages between Stranraer and Larne these are excellent. The London and North Western Railway Co. run on their 8 p.m. express, except on Saturdays, and on their 8.40 express on Sundays, from Euston Station, one large 42 ft. sleeping-saloon and one composite carriage of the same length, consisting of two first-class compartments with toilet accommodation, and one second-class and two third-class compartments, and a receptacle for luggage. A sleeping-saloon car and through carriage for first and third-class passengers and their luggage are also run between the Midland St. Pancras Station and Stranraer by the 8.25 p.m. train, except on Saturdays and Sundays. On Sundays the carriages are attached to the train leaving St. Pancras at 9.15 p.m. The extra charge beyond the first-class railway fares for the use of the sleeping-saloon to Stranraer on both railways is 5s.

Passengers arrive at Stranraer harbour at 7.5, except on Mondays, in the morning, and reach Larne at 9.35. From thence an express train conveys them to Belfast, where they arrive at 10.40, and Londonderry at 2.40 p.m. In the afternoon (except Sunday) an express train leaves Belfast at 4.15 and arrives at Larne at 5.1. It starts from Stranraer harbour at 8.40. From this place similar through sleeping-saloons and carriages, both London and North Western and Midland, to those before mentioned convey passengers to London and intermediate stations, at the same extra rates for the saloons. The London and North Western Railway through carriages arrive at Euston station at 7.45 on the following morning, and the Midland Railway Co.'s through carriages at St. Pancras station at 7.15. On Monday morning, the trains arrive at Stranraer Harbour at 8.10 a.m., and at Larne at 10.40, Belfast at 11.45, and Londonderry at 2.40.

This short route to and from Ireland is much used by residents in the Midland Counties and in Lancashire and Yorkshire, as well as by Londoners and persons from the South of England and the Continent. When the new boat is put on the service, the financial success of its owners will probably much increase, as many more passengers will avail themselves of it, not only to economise time, but to enjoy the additional comforts which the new steamer will afford.

## BILGE PUMPS AND THEIR STRUMS.

A MEETING of the Institute of Marine Engineers was held in the Langthorne Rooms, Broadway, Stratford, on Friday evening, 10th October, at 7.30, when a paper on "Bilge Pumps and their Connections" was read by Mr. Wymer.

The meeting was presided over by Mr. W. J. Charr.

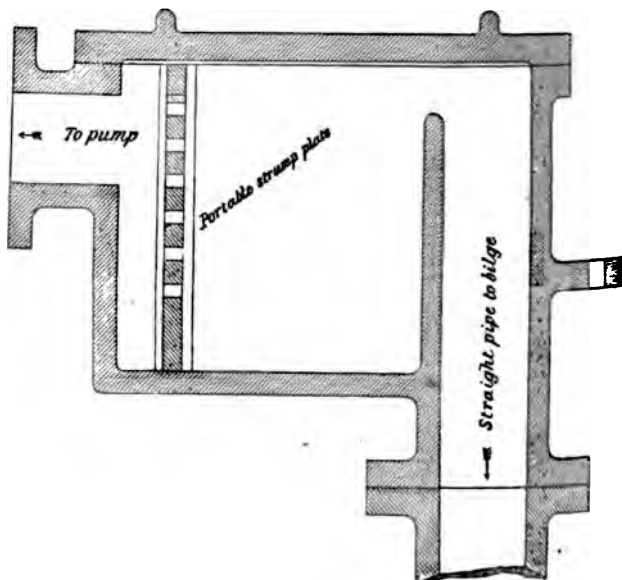
Mr. WYMER commenced by saying—The importance of the subject must be my excuse for asking you to give me your attention for a little time this evening. In looking back over many years of steamship practice, the most important thing in a gale of wind on board a steamship (next to the working of the main engines in maintaining the position of the vessel) is, in my opinion, the working of the bilge pumps, which, although they may be said to form part of the main engines, are yet quite separate from them in the duty they have to perform, viz., the clearing the vessel of the water which from any circumstances has got into the ship, endangering her buoyancy and efficiency.

I need hardly remind you of the perilous position of a steamship to whose engine-room the sea has got access, beaten the pumps by choking the strums, washed up the stokehold plates, and is fast putting out the fires; the engines meanwhile, for want of steam, only just turning over the centres.

The end of such a ship is not far off if she is distant from port and the gale does not moderate.

The slow speed of the engines renders the bilge injection connected to the circulating pump of little effect, and not to be depended upon (the strums in most cases being in an inaccessible position and choked), and baling, even if resorted to, is seldom of much use in a gale of wind.

Many of you will no doubt say, "In a well regulated engine-room this should not occur," and I agree with you; but before I have concluded my remarks on the subject, I think you will acknowledge that, although an experienced and careful engineer may have charge of the engine-room, and may have in force good regulations for the same, he may under certain circumstances be completely beaten, owing to defective connections and arrangements of the bilge pumps and strums, although on the tracing of the pump and pipe arrangements of the vessel they may appear to be nice and effective.

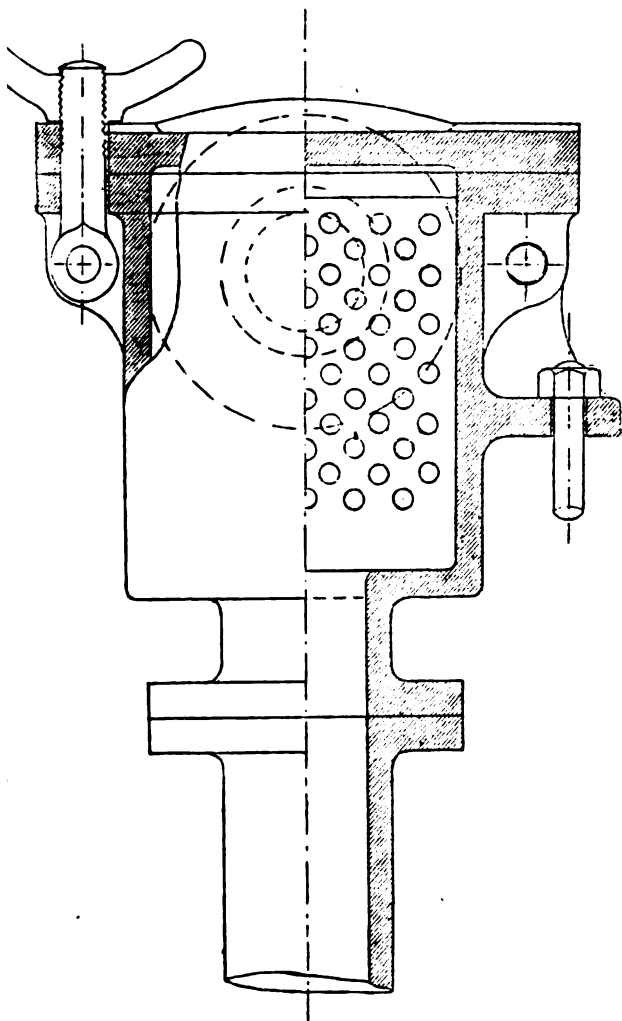


In looking into this subject I would like to take you back to the time when the steamships of this country were constructed of wood, and some noble specimens of naval architecture they were, but many of them had a fault which is not often found in an iron vessel, they leaked considerably through straining when in a sea way, and this water had to be kept under by the bilge pumps and bilge injection, led into the condenser. The bilge pump in these vessels was a pump therefore of much importance, and required to do its work with as little trouble to those in charge as possible. The engines most in use at that time were of the side lever pattern, and the bilge

pumps were bolted on the wooden floors of the vessel, and worked from a stud in the side lever a little out from the main centre. It was an open-mouthed pump with a solid packed piston, having an eye on the top of the piston, to which was attached the rod, coupled at the upper end to the stud in the side lever of the main engines. The valve chests were cast on the pump seat, and hinged valves were fitted to the chests. A pipe on the suction side led into the bilges, on which was fixed a strum, and the discharge was carried up the side of the vessel (generally above the load water line) and discharged over-board.

The solid piston, which worked generally low down in the pump, forced out what air got access to the pump through the discharge valve, and left very little windage in the pump, and the pumps being placed so low down, they were from this cause pretty effective, and did not give much trouble.

Should the strums choke, they were easily got at by lifting a plate of the starting platform which was placed low down between the engines.

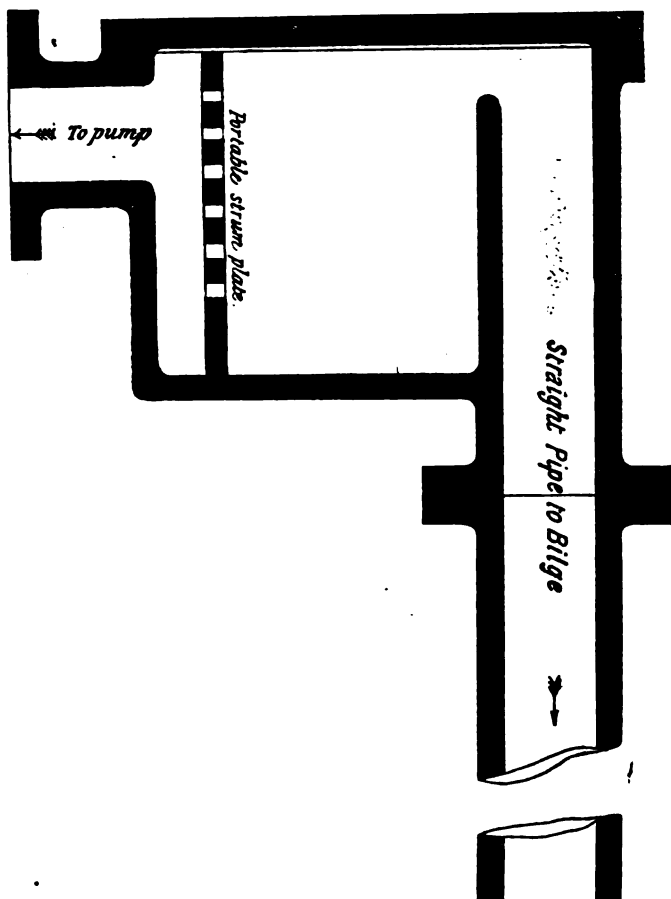


New ideas came in with iron steamers, and new designs of engines, and it became the practice to attach the feed and bilge-pump of the plunger-pole pattern to the air-pump cross-head of the engines. This made a prettier engine, and if carried out with a view to the effective working of the pumps, nothing could have been said against the design or arrangement; but, looking back now over a long vista of years, much can be seen to militate against the good working of the pumps.

In many cases the valve chests were placed at a distance outside the side levers and connected to the bottom of the pumps by a pipe between them and the valve chests. This arrangement, although looking well on paper, and possessed of

the advantage of having the valve-chest outside of the working of the side lever, had this defect, that the windage around the plunger-pole of the pump, and in the intervening length of pipe to chest, was so great that the pump would continually cease to work when most required, owing to the pump becoming charged with air; and this, to such an extent, that in bad weather, an engineer's attention was almost wholly (if not quite) taken up with the duty of clearing the vessel of the water which in so many ways, through low freeboard, coamings, &c., got into the vessel, and resource had frequently to be made to the condenser bilge injection.

With the advent of screw steamers the defects in the construction of bilge pumps have not been entirely eradicated, but have in some cases been intensified by the sole or foundation of the engines being raised to suit the centre of the shaft, thus also raising the bilge pump to a greater height from the water they have to clear out of the vessel. It may be noted here that the plunger-pole pump is the worst form of pump that can be made for the purpose of raising water from any depth below its level; and when used for this purpose, as it is, in steamships, it should be so designed and arranged in such a manner (as it has been graphically expressed by Mr. J. McFarlane Gray, one of your Vice-Presidents) that all the water in the pump should run out through the valves and barrel of pump, and the pump be left empty when turned upside down.



This can only be the case when the outlet or discharge valve is placed close to the neck of the stuffing box or upper part of the pump, thus clearing the pump chamber of all air at each down stroke of the pump plunger-pole.

You will naturally ask: "What shall we do with pumps already fitted, and which have the defects pointed out in this paper?"

A ready remedy, and one that no doubt many of you have found out, can easily be applied to a defective pump, if the valves of the pump are in order, viz., by fitting a small non-return pet valve in the position under the neck of the stuffing

box, thereby allowing the air to be forced out at each down stroke of the pump plunger-pole in the same manner as would be the case if the discharge valve chest was fitted in its proper place under the neck of the stuffing box. The arrangement must be valvular, so as to prevent return of air to the pump on the upstroke. Lining the pump barrel to fit plunger-pole is a useful remedy in case of bad arrangement of valve chests, as it reduces the windage of the pump around the plunger-pole, and increases the efficiency of the pump.

I now come to the second part of the paper, viz:—Pump Strums; and will not detain you much longer. It has been the general practice to fit these on the lower end of the bilge pipes between the floors of the vessel as close to the bottom as possible. This arrangement, although it may look well on a tracing of the pipe arrangement, has very serious defects in practice. In some cases the strums so placed are most difficult of access even in harbour or in smooth water; but in a sea-way, with a little accumulation of water in the bilges, it is a matter of almost impossibility for a man to remain at his post and keep the strums clear.

This, in my opinion, should not be. All strums should be reasonably accessible, even when some water may have got into the bilges. Inaccessibility of bilge pump strums has, I am much afraid, led to the loss of many a vessel and her crew. To remedy this defect, in fixing strums of bilge pumps they should, in my opinion, be fitted above the engine-room or boiler platforms, with a straight, open-mouthed pipe led into the bilges. This would avoid all necessity for men crawling below platforms to get access to strums, or getting wet by the splashing of water in the act of clearing the pump strums, a result which I am sure you will all agree with me is much to be desired. At the same time it would conduce much to the safety of the vessel, by the engineers in charge having a better command of the pumps and their strums.

A design of a mud or bilge box for a new steamer is shown, from which it will be seen that the whole of the work of cleaning the strum is performed above the engine or boiler platforms.

Enlarged views of the mud or strum box are also exhibited.

The discussion which resulted at the conclusion of the paper was maintained by Messrs. J. Mc. F. Gray, James Adamson (Hon. Sec.), Sommerville, Rowe, Hawthorn, and Bruce, in the course of which several experiences were detailed, illustrative of the serious defects which have existed and still exist in the bilge and ballast pumps and their arrangements. One case from his own experience was cited by Mr. Hawthorn, where, during bad weather the ballast tank gave out, and flooded the engine-room, the coal bunkers emptied themselves into the bilges and choked the pumps. The greatest difficulty was experienced on the part of the engineer in keeping the water out of the furnaces, as the bilge suction pipes became filled with coals, and though cleared time after time, the pumps could hardly keep the water from gaining upon them with all their labour. By dint of strenuous effort, the steamer was got into port, but it was only by an effort, and had the haven of safety been further away, the ship had been lost.

A parallel case was related by the hon. secretary in his experience at sea, some 11 or 12 years ago, when overtaken by a typhoon off Formosa. From the seas shipped and the water otherwise accumulating, the engine-room and stokehold were flooded to the flooring plates; with the roll of the ship the stokehold plates, firing tools, &c., began to float hither and thither, the fires in the low furnaces were put out by the water, the others being merely kept alight by hand firing, the firemen dodging to avoid the heavy plates as they passed to and fro at every roll of the ship. The bilge pumps were choked by the coals and debris, the rose plates on the skin of the ship in the bilges were continuously being cleared, only to fill up again each time. The pipes were then cut above where they were choked, and a man stationed to keep them clear, the engines meantime, for want of steam, just moving, and the pumps throwing very little water. The water was also being baled out of the stokehold by ash buckets through the ventilators, and only by persistent efforts on the part of the engineers was the steamer kept afloat until the extreme violence of the typhoon was over.

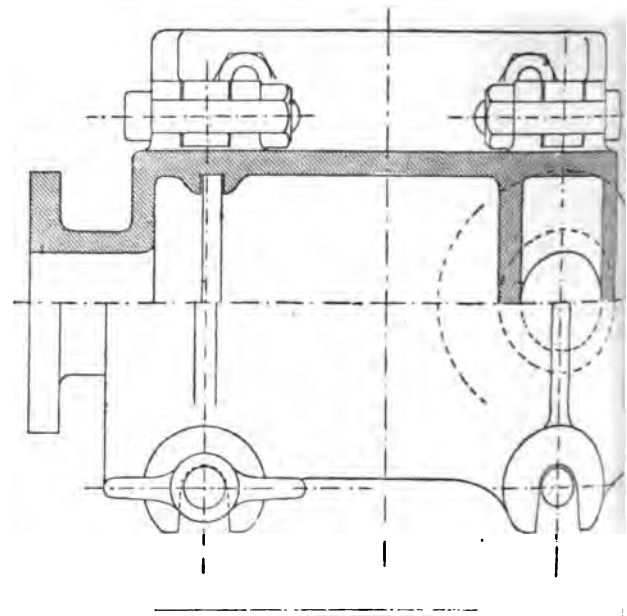
In these and other illustrations which were given the great importance of having a good system and arrangement of pumps and connections was shown, as no doubt danger, if not destruction, often results from want of attention to what is too often treated thoughtlessly, as being of very minor importance in the economy of the engine-room fittings and appliances. Mr.

Wymer replied to several questions and remarks put forward in the course of the discussion, and related several incidents which had come under his notice, illustrative of the ways in which different men behave in emergencies; one, by sharp discernment and prompt, fearless action, adopts an expedient, or uses the means, unlikely or otherwise, which lie to his hand, while another may succumb under the difficulty without an effort.

The proceedings were of an interesting, and frequently of a lively character, and the Institute is not only sustaining the character it has already made, but advancing in strength and authority, if we may judge from the large and influential attendance its meetings command.

Votes of thanks were proposed and seconded to Mr. Wymer and the Chairman by Messrs. Crook and Roberts and by Messrs. Ruthven and Bruce respectively, and the meeting closed with an announcement from the Secretary that the reading-room and library are open every evening from 5 to 10.

The general business meeting will be held on Friday, November 1st, at 7 p.m., to be followed by a paper on the "Progress and Development of the Marine Engine," by Mr. A. Beldam. He had received letters from various parts of the world complimentary to, and manifest of, interest in the Institute; these were indicative of a progress which he hoped would continue and be maintained.



**NEW GRAVING DOCK AT NORTH SHIELDS.**—On October 18th Messrs. H. S. Edwards & Sons opened their sixth dry dock, which is situated at North Shields, and the event was celebrated by a large gathering of the friends and customers of the firm. The new dock, which is the largest on the river, is at the Bull Ring, North Shields—a most central part for such an undertaking. The dimensions of the dock are:—Length, 348 ft.; breadth, 52 ft.; depth, 23 ft. The adjoining dock (No. 5) is 367 ft. long by 50 ft. wide, with a depth of 22 ft., and the blocks in both docks, on which vessels' keels rest, are 5 ft. high, thus enabling men to stand upright when doing repairs to the vessel's bottom, a great improvement on the older class of docks, where the workmen are cramped for height, and have not unfrequently to lie on their backs to get at their work. The two docks are so placed as to enable the powerful centrifugal pumps to work at both. These pumps are of the very latest design, and embrace every modern improvement. They have been made by Messrs. W. H. Allen & Co., of the York Road Works, Lambeth, London, and are capable of discharging water from the docks at the rate of 18,000 gallons per minute. After the dock had been filled, the gates were opened, and the screw steamer *Ambient*, Captain Errington, owned by Mr. James Westol, of Sunderland, entered. The dock was designed by Mr. F. R. N. Haswell, and it was executed and completed by Messrs. Edwards & Sons themselves.

**MAGNOLIA ANTI-FRICTION METAL.**

**A** LONG with the general adoption of high steam pressures, there has been a tendency to increased speeds of piston and revolutions of screw steamers' propellers, but to a large extent a development of this policy, in many cases a wise one, has been retarded by the increased difficulty of avoiding heated bearings and abnormal friction. Even in ordinary experience in marine, locomotive, and general engineering, the drawbacks consequent upon metal running out of bearings and journals is certainly not unknown; but since the substitution of white metal there has not been any very extensive adoption of any other material. Recently the Magnolia Anti-Friction Metal, which has been in use for about two years on American locomotives and steamships, was brought before the notice of marine engineers. This latest material for bearings and other working parts, subject to considerable wear and tear, is manufactured at Brooklyn, New York. During a series of most elaborate trials with Magnolia Metal, carried out at Washington by the United States Government Engineering Authorities, Magnolia Metal was found to be much superior as an anti-friction metal to Parson's white brass. Every-day working experience has corroborated this view, most of the North American Railway companies having testified to its giving a much better record than any other brasses.

Experience with Magnolia Anti-Friction Metal is not, however, limited to locomotives and land engineering. It has been employed on steamships owned in Great Britain and Ireland,

the United States, &c. Messrs. Workman, Clark & Co., Limited, Belfast, have used it for some time in the thrust and other bearings of several steamers, and state it is by far the best metal in every respect they have ever had experience with. In the steamship *Sobralense*, of the Red Cross Line, Liverpool, a set of crank pin brasses, with Magnolia Metal run in, made a distance of 11,000 miles with no perceptible wear on the metal, the shaft showing a brilliant wearing surface with no signs of cutting, although the bearings were imperfectly fitted. It has also been tried on eight steamers of the Oriental Steamship Co. with similarly gratifying results, *e.g.*, in the *s.s. Fidele Primavera's* bottom-end brasses, after running three Black Sea voyages, the tool marks were not worn out of the metal.

Experimental tests recently carried out by Professor Robert H. Smith, of Mason's College, Birmingham, give results coinciding with the experience of practical working, and there appears to be little doubt that not only is the life of brasses fitted with Magnolia Anti-Friction Metal prolonged, but that there is also a great saving in the cost of lubricants.

The experimental comparative trials of Professor R. H. Smith are exceptionally interesting; but as over three or four thousand tests were made, in each of which the temperature of the bearings and friction were carefully and exactly measured, we can only find space for a few of the principal results obtained in the most crucial trials. The results of brass bearings with Magnolia Metal as linings, length  $2\frac{1}{2}$  in., diameter 2 in., temperature and co-efficient of friction, were as follows:—

August 18th, 1889.

Trade Name of Oil.	Composition of Oil.	Air Temperature.	Weight of Oil used per hour. Oz.	No. of Drops of Oil per Minute.	Pressure 1,990 lbs. Revolutions per Minute.				Pressure 2,980 lbs. Revolutions per Minute.			
					100		200		100		200	
					Temper-ature.	Friction Co-effnt.	Temper-ature.	Friction Co-effnt.	Temper-ature.	Friction Co-effnt.	Temper-ature.	Friction Co-effnt.
Spindle Oil. A.	Scotch Mineral Fatty Oil.	69°	4	16	70°	·0170	72°	·0150	74°	·0165	78°	·0133
Same Journal with only Water as Lubricant.												
August 19th, 1889.												
Water.	1 Pure Water from Town Main.	About 65°	1·75	40	81°	·0273	81½°	·0196	91½°	·0592	137°	·0562

Same journal run dry (without either oil or water), air temperature about 65°:—

August 19th, 1889.

Total Pressure Lbs.	Pressure Lbs. on one side.	Revolutions per Minute.	Temperature Fahr.	Surface Frictional Force.	Co-efficient of Friction.
995	497½	100	100½	71	·0713
		120	101½	66	·0663
		150	102	61½	·0618
1990	995	100	109	185	·0929
		150	118½	165	·0829
2985	1492½	100	127	233	·0780

It will be noticed how comparatively slight are the variations of temperature, and this appears all the more marked when the corresponding results of Babbitt's metal and gun metal are compared, obtained as they were under similar circumstances, in a machine specially designed by Professor R. H.

Smith to reproduce as nearly as possible the practical working conditions of machine bearings.

The following are the tests of journal friction with best gun metal bearings well worn to a smooth surface (lubricant, sperm oil):—

SIZE.		Total Pressure Lbs.	Pressure on One Side Lbs.	Pressure per Square Inch.	Oil Drops per Minute.	Revolutions per Minute.	Surface Speed Feet per Minute.	Temperature Fahr.	Frictional Force Lbs.	Co-effnt. of Friction.	REMARKS.
Diam.	Length										
2in.	2½in.	1990	995	199	20	100 200	52.4 104.8	80½° 84½°	145 75.5	.0728 .0379	28th August, 1889.  Oil used at the rate of about .75 oz. per hour.  With a load of 4000 lbs. the capacity of the machine was insufficient to measure the friction at either of the two speeds.
		3980	1990	398	20	100 200	52.4 104.8	135° 205°  Air Temperature.  70°			

which call for little or no comment, the greatly increased temperature and its variation, as compared with lubricated Magnolia metal with the heavier load, is, however, notable;

and the same remark will be found to hold true of the results of the tests of journal friction with brass bearings, lined with the best quality of Babbitt metal (lubricant, sperm oil):—

SIZE.		Total Pressure Lbs.	Pressure on One Side Lbs.	Pressure per Square Inch.	Oil Drops per Minute.	Revolutions per Minute.	Surface Speed Feet per Minute.	Temperature Fahr.	Frictional Force Lbs.	Co-effnt. of Friction.	REMARKS.
Diam.	Length										
1in.	2½in.	1990	995	398	18	100 200	26.2 52.4	84° 101°	314 226	.1577 .1135	22nd August, 1889. Oil used at rate of 0.61 oz. per hour.
		3980	1990	796	18	100 200	26.2 52.4	118° 151° Air Temp. 68°	572 424	.1437 .1065	After test, Surface of Bearing smooth, but somewhat cut.
1½in.	2½in.	1990	995	265	20	100 200	39.3 59.0	96½° 130°	257 217	.1291 .1090	26th August, 1889. Bearing would not stand the 4,000lbs. pressure.
		2985	1492	397	30	100 200	39.3 59.0	150° 193° Air Temp. 63½°	373 307	.1249 .1028	Heating rapidly under it at 100 Revolutions. In order to carry 3,000lbs. the supply of oil had to be increased to 30 drops per minute.

The conclusions arrived at by Professor Smith, and which are substantiated by the above results, is that Magnolia Anti-Friction Metal is much superior to either Babbitt or gun-metal. It produces less friction, it keeps the bearing temperature lower, requires less lubrication, and possesses greater durability.

Quoting from a summary report of the Professor, we find, he says:—

"This characteristic of durability is a most important one. Within the wide limits of condition covered by my tests it would be true to say that the longer the Magnolia Metal bearing is used, and the more severe the duty imposed upon it, the better becomes its condition."

"It is satisfactory to note that the elevation of bearing temperature is less than that of the surrounding air is, under all

ordinary conditions, extremely low. With prolonged use the temperature shows no tendency to rise, and the surface becomes more and more smooth and glossy.

"The general conclusion at which I have arrived from these experiments is that Magnolia Metal is a very excellent material for bearings; that the special good qualities appear more particularly when it is subjected to intense pressures, such as could not be borne by other metals without firing or melting; and that under very trying circumstances the Magnolia Metal may be trusted to remain cool, that is, at a temperature that does not interfere with good working."

The Magnolia Anti-Friction Metal Co. of Great Britain has its principal offices at 75, Queen Victoria Street, London, E.C.

## LLOYD'S REGISTER SHIPBUILDING RETURNS.

FROM the returns compiled by "Lloyd's Register of Shipping," it appears that, excluding warships, there were 521 vessels, of 882,749 tons gross, under construction in the United Kingdom at the close of the quarter ended 30th September, 1889. The particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1888, for the purpose of comparison:—

Description.	30th Sept., 1889.		30th Sept., 1888.	
	No.	Gross Tonnage.	No.	Gross Tonnage.
<b>STEAM.</b>				
Steel ... ..	380	759,532	279	614,908
Iron ... ..	57	36,951	49	28,930
Wood and composite ...	4	200	1	89
<b>Total ... ..</b>	<b>441</b>	<b>796,683</b>	<b>329</b>	<b>643,927</b>
<b>SAIL.</b>				
Steel ... ..	41	73,417	27	42,208
Iron ... ..	7	9,995	8	9,580
Wood and composite ...	32	2,654	36	3,260
<b>Total ... ..</b>	<b>80</b>	<b>86,066</b>	<b>71</b>	<b>55,068</b>
<b>TOTAL STEAM AND SAIL</b>	<b>521</b>	<b>882,749</b>	<b>400</b>	<b>698,995</b>

Comparing the present returns with those for the quarter ended 30th June, 1889, a decrease is observed in the vessels under construction of 15 vessels of 46,862 tons; and a decrease is also noticeable in the vessels for the construction of which preparations are being made, there being now 125 vessels of 242,800 tons "preparing," against 165 vessels of 308,172 tons at the close of the previous quarter. It should be added that, of the vessels under construction in the United Kingdom at the end of September, 448 vessels of 780,379 tons, or approaching 90 per cent., were being built under the supervision of the surveyors of Lloyd's Register, with a view to classification by that society.

## THE "CLIMAX" LIGHT.

THE introduction of the Lucigen Light a few years back has induced quite an important development in lamps constructed for burning the commonest oils, and at the same time capable of giving out a powerful and brilliant light, which have been specially useful in lighting up large open spaces, such as shipyards and other works. One disadvantage in these lamps has, however, been that some mechanical power has been required to operate the light; but a lamp, which has been termed the "Climax" light, has been now introduced by Mr. W. G. Robertson, of Elland, which has been specially designed to dispense with all outside sources of power. In this new lamp, of which we give an illustration, the inventor uses the gas generated in the burner as pressure for the top of the oil, and neither compressed air, hand power, force pumps, or steam are required to work the light. This arrangement necessarily makes the lamp extremely portable and wonderfully easy of management. When once the tank has been filled with oil all the attendant has to do is to make the burner hot by means of a handful of ignited oily waste, and then turn on the oil, which runs from the tank through the bottom pipes and thence upward to a generator, where the oil is converted into gas, which, rising up, is carried into the

top of the tank and exerts the pressure upon the oil, which in other lamps has hitherto been produced by mechanical means. By this simple arrangement the gas issues at a pressure of 20 lb. after a very few minutes working, and the light keeps the generator hot with the lower part of the flame, whilst the top part gives off a light of fine white brilliancy. This is a wonderfully steady light, and will burn without further attention for about ten hours, when the tank requires replenishing with oil. The light is arranged



to burn the ordinary creosote oil, and can be placed anywhere on a brick or stone pillar, or on brackets, or upon a wall, or it can be sent out on a cast-iron pillar with a swivel top, as shown in our illustration, so that the light can easily be turned on in any direction. It is claimed for this new lamp that it will give a light equal to 3,000 candle power at a cost of 2d. to 3d. per hour, according to facilities for obtaining oil, and certainly the simplicity of its arrangement and working make it a great advance upon similar lamps which have hitherto been in the market.

**FASTEST ON RECORD FROM TABLE BAY.**—Messrs. Donald Currie & Co.'s Royal Mail steamer *Roslin Castle* arrived safely at Plymouth at 4 o'clock on Saturday afternoon, October 12th, thus completing her passage from Cape Town in 16 days 22½ hours, including detention of 3 hours 45 minutes at Madeira, the nett steaming time being thus only 16 days 18 hours 45 minutes. This passage is by far the shortest record run between Table Bay and Plymouth, beating the best previously recorded run by nearly eight hours. Average steaming time, 14·62 knots. The *Roslin Castle* experienced a very heavy south-west sea all the way from Madeira.

## PARIS EXHIBITION.

### GALLOWAYS' LIMITED (OF MANCHESTER) EXHIBITS.

THE well-known Galloways, Limited, Engineers and Boilermakers, Knott Mill Iron Works, Manchester, maintain their reputation at the Paris Exhibition. The illuminated fountain, which have been said to be "the greatest success" of what must be admitted is from a general point of view the greatest International Exhibition ever held, have been installed by Galloways, Limited. As we omitted mention of these fountains in our preliminary article in our June number, a brief description is now given.

The basement of the fountains consists of a circular brick-lined chamber immediately in the centre of the basin, having a diameter of upwards of 40 ft., and being 8 ft. in depth, provided with benches for supporting the lamps. This basement is connected by means of a subway to the manipulating tower, the subway being also used as a culvert for the supply water pipes together with all the electrical leads, returns, speaking tubes, and signal wires, by which arrangement everything is readily accessible for examination and attention. The basement is covered with a deck of timber supported on substantial timber framing, and made watertight by a cover of sheet lead, which is carefully puddled in clay, over which is a concrete bed finished with cement forming the bottom of the fountain basin. The base of the manipulating tower contains a powerful Blackman air propeller for removing all the carbonic acid gas evolved by the carbons burning at a necessarily rapid rate of consumption.

The fountain operator is placed in an upper floor of the manipulating tower, distant 50 yards from the fountain basin. In this room is fitted a system of levers, bell pushes, and signals, by which the operator has complete control of the whole working of the fountains, being able to adjust the various jets directly and instantaneously, and to instruct the attendants below as to what combination of colours to use.

The water under pressure is conveyed to the fountain basin from the municipal supply by a range of suitable pressure pipes, terminating in a distributing box, which is provided with a series of valves, controlling the different systems of jets, these valves being connected by wires with the levers in the operating room. In the fountain basin is placed a series of pipes in connection with the jets, these again being connected with their respective valves.

The fountains consist of over 100 nozzles, varying from  $\frac{3}{4}$  of an in. to about 2 in. in diameter. There is one centre jet with ring of jets surrounding it, then a circle of jets somewhat smaller than the centre one, each of these being also encircled by a ring of jets; and again an outer ring having other forms of jets, also a system of sprays, which are arranged for giving a feathery fern-like display which is very effective.

To illuminate these jets there are 17 skylights, under 16 of which is provided a powerful hand-fed electric lamp, adapted for a current of 60 amperes, and under the 17th skylight are fixed two similar lamps, thus making a total of 18 lamps, which are divided into six groups of three each. The rays from these lamps are

directed by powerful reflectors through the skylights above. The total power of these lamps is equivalent to over a quarter of a million candles. Over each lamp and immediately under the skylight are provided slides containing coloured glasses, which are arranged so as to allow of any change or combination, the whole being controlled by one man.

Galloways Limited have also in the Machinery Hall, near to the exhibits of the Farnley Co., a large stand, on which are exhibited numerous specimens of their specialties.

The patent Galloway Tube, suitable for a boiler 30 ft. long, and 8 ft. diameter, capable of working at 100 lbs. pressure, is a "host" in itself. This flue is constructed of best selected mild steel plates, and consists of two furnaces joining into one flue. The furnaces are in solid welded rings, 3 ft. 3 in. diameter, flanged by machine, and are riveted together with a strengthening ring between the two flanges. Great care is taken, in drilling the rivet-holes, to ensure absolute accuracy, and hence, relative freedom from strain on the rivets. The flue formed by the junction of the furnaces has ample room for cleaning and examination, and is supported by 38 Patent Galloway Cone Tubes, all interchangeable, and with their flanges square with the centre line of tube, thus putting less strain upon the material during manufacture. Four patent pockets are fixed in the flue to direct the flame amongst the cone tubes; also two expansion pockets at the back end to prevent the undue escape of the heated gases, and to give the necessary space in the end plate for expansion and contraction.

The flue is provided with two boiler ends, each in one piece of the best selected mild steel; the front plate is prepared for attachment to shell by angle ring, is turned on its outer edge, and the openings for flue ends are bored out; the back end plate is flanged for connection to shell.

A few rings of the shell are placed in position to show the connection of the flue ends and shell, which are attached to each other by gusset plates, fastened by double angles, both to shell and flue.

Possibly the greatest attraction of Galloways' Limited, Stand is a trophy of their Patent Machine-made Cone Tubes, suitable for insertion into these makers' deservedly well-known boilers, as well as into Lancashire or two-flued boilers. The tubes of which the trophy is formed vary in dimensions from 5 ft. long, 10 $\frac{1}{2}$  in. diameter at the large end and 5 $\frac{1}{2}$  in. diameter at the small end, to 1 ft. 6 in. long, by 6 in. and 3 in. diameter at the respective ends.

There are also on Galloways, Limited, stand, about 60 specimens of boiler mountings, including stand pipes, man-holes, &c., of which the company construct large numbers for other boiler-makers in all parts of the United Kingdom and the Continent.

An interesting miniature exhibit is a copper model of a Galloway boiler, with the upper portion of the shell removed, so that the visitor may readily see the internal construction.

The great success that has attended this manufacturing and boiler-making company, in providing steam generators for land purposes—including ship-building, marine engineering, and other establishments, is evidenced in the fact that over 7,500 Galloway boilers have been manufactured by the company.

There has also been a large demand for these boilers in connection with International Exhibitions, at home and abroad, including Vienna (1873), Philadelphia (1876), Paris (1878). At each of these exhibitions, as well as at the three held at Kensington in 1884, 1885, and 1886, and the Liverpool (1886), and Manchester (1887) exhibitions, the company supplied boilers by special request, and on all the occasions obtained the highest award.

M. Jacques Pérès, 46, Boulevard Magenta, Paris, is the agent for Galloways Limited.

## PARIS EXHIBITION.

### MACHINE TOOLS.

#### THE D. E. WHITON MACHINE COMPANY.

IN the American Section the exhibits of the D. E. Whiton Machine Co., of New London, Connecticut, U.S.A., in the Palais des Machines, are

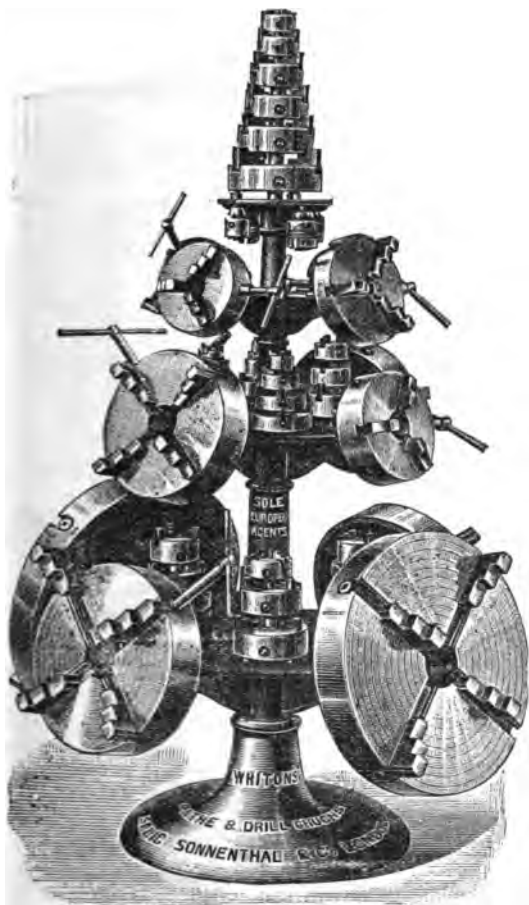


FIG. 1.

noteworthy. One of the leading features of this company's stand is the trophy of chucks, of various sizes and for different requirements on lathes, drilling machines, &c., which we illustrate in Fig. 1.

This trophy is surmounted with six of Whiton's New Geared Universal Scroll Chucks of various sizes, the

distinctive feature of which consists in the front plate or body carrying the scroll and jaws being of one piece only, which is also directly attached to the face plate. The body of the chuck is thus made without any joint, and is very deep under the jaw, so that there is no danger of breakage from the corner of the slot to the point. Immediately under the sixth Whiton's New Geared Universal Scroll Chucks are specimens of the company's "1883" drill chucks and geared drill chucks, both of which have a good reputation for holding small drills. The lowest group or ring, as

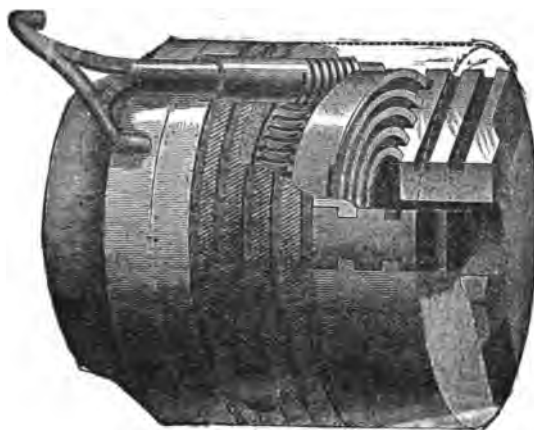


FIG. 2.

well as the chuck on the left hand side of the next group, are the Whiton's New Independent Reversible Jaw Chucks, which are provided with four independent reversible steel jaws, each of which is operated by a separate screw, the entire thrust of the screw being received on a hardened steel bearing. It will be noticed from our illustration (Fig. 1) that these chucks are provided with circular lines on the face by which to set the jaws true for holding round work, every variety of which, as well as square, irregular, or eccentric work, may be held in these chucks to be



FIG. 3.

operated upon by the tool; even considerably larger than the diameter of the chucks. On the right hand side of the trophy there is a New Geared Universal Scroll Chuck with inside jaws, and the third tier consists of the same type of chuck, that on the left being fitted with drill jaws.

Another exhibited speciality of this kind, not visible in the trophy, is Whiton's "Hercules" Drill Chuck, Pequot's Patent, which are made in three sizes, viz., 2 in., 2½ in., and 3 in. diameter. In Fig. 2 we give an external and partially sectional view

of the Hercules chuck, the principal features of which are the rapidity with which it can be changed to receive a large or small drill, and the variety of convenient means for tightening suited to all requirements, from the lightest to the heaviest work. The central or body part of the chuck is attached to the drill spindle in the ordinary manner, and the jaws are opened or closed by turning the outer shell or case carrying the jaws upon the central or body piece. The outer case is turned freely by hand, and the jaws are thus rapidly

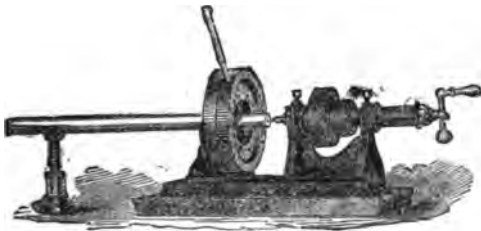


FIG. 4.

changed for large or small drills. For all small drills sufficient grip may be obtained by simply tightening the chuck by hand. If more power is required, the key furnished with the chuck may be easily applied as a spanner, being adapted to this use. Should still more power be required, the application of the screw end of the key in one of the openings, it is claimed, closes the jaws with a more powerful grip than any device hitherto employed in drill chucks, after which the key may be easily removed, leaving the chuck without projections.

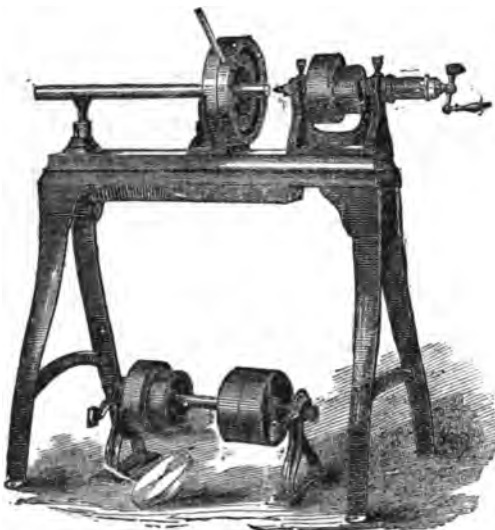


FIG. 5.

To loosen the chuck, the key is applied in the same manner in the other opening, after which the jaws may be readily set for another size as before. In placing a drill, it is first grasped in the chuck by moving the jaws by hand, and without difficulty it may be set so as to run true, the key is then applied, giving the final grip.

Centering machines are another specialty of the D.E. Whiton Co., two of which are exhibited, of which we give illustrations in Figs. 3, 4, and 5. These machines

are designed for centering and drilling round iron, preparatory to working it in a lathe, and each is a combination of a Universal scroll chuck, for holding the work, with a traversing spindle carrying a drill: the two being so arranged as to be perfectly central. The machine shown in Fig. 3 at one operation will centre and drill any size of round iron, from  $\frac{1}{4}$  to 3 in. diameter. The spindle being fitted with a  $\frac{1}{8}$ -in. twist drill, which may be ground if broken, and replaced, when used up, with but little trouble. Oil cups for lubricant for the bearings are fitted, and the machine stands in an iron pan, provided for the reception of the oil and chips from the drill. The accuracy and despatch with which it performs its work combine to render it a useful tool for machine shops.

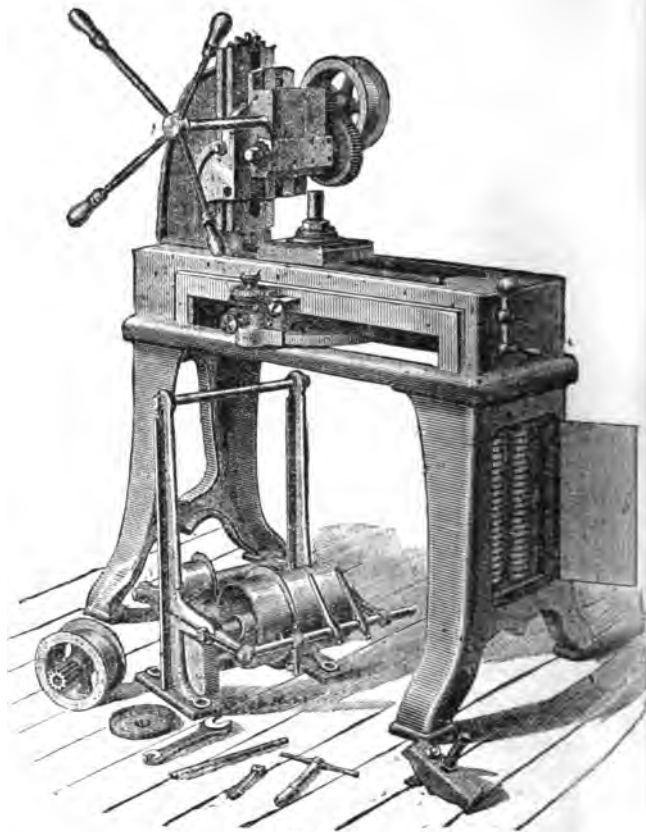


FIG. 6.

In Fig. 4 a larger and heavier machine is represented, which will centre iron from  $\frac{1}{4}$  in. to  $4\frac{1}{2}$  in. in diameter. It is set on a bed about two feet long, and the chuck is bolted to a separate stand, which is fitted to the bed and can slide five inches, thus giving more or less room between the work and drill as may be required.

The machine illustrated in Fig. 5 is shown on a stand, as are all the machines exhibited. It is the largest size usually made, and accommodates round iron from  $\frac{1}{4}$  to  $5\frac{1}{2}$  in. diameter. The chuck can slide on the bed 18 in., giving ample room for any usual description of work. A larger machine centering shafts up to  $7\frac{1}{2}$  in. for heavy work is made to order, as also are machines of any of the sizes for centering square iron.

The last specialty on the company's stand we refer to is D. E. Whiton's Improved Gear Cutting Machine, which we illustrate in Fig. 6. It occupies a floor space of two feet by four feet, and is simple, strong, and compact, and is adapted for tool and general machine and repair shops, &c. The cutter is fed through the blank by hand, as shown, and it may be adjusted to the centre or half-inch either side if desired. This machine will cut every number to 100, every even number to 186, and has a very wide range of higher numbers. Spur, bevel, and worm wheels to 32 in. diameter, 8 in. face, 6 diametral pitch, and less in steel, iron, brass, or wood, can also be cut efficiently, sizes under 15 in. diameter being specially suited to the capabilities of the machine. It may be set accurately at any desired angle for bevel gears by a nicely graduated arc, and has a graduated adjustment either

## PARIS EXHIBITION.

MESSRS. ANT. FETU-DEFIZE ET CIE.'S (OF LIEGE)  
EXHIBITS.

MESSRS. ANT. FETU-DEFIZE ET CIE., of Liege, who are the manufacturers of Otto Gas Engines for Belgium, Holland, and Portugal, have one of the largest collections of machine tools exhibited in the Machinery Hall.

The principal machines on their stand are to be seen in motion, driven by an Otto gas engine, of the ordinary single cylinder form, exerting 6 I.H.P. Messrs. Ant. Fetu-Defize et Cie. have also a 5 H.P. Otto gas engine, with two cylinders, on their stand, which has been specially constructed for driving

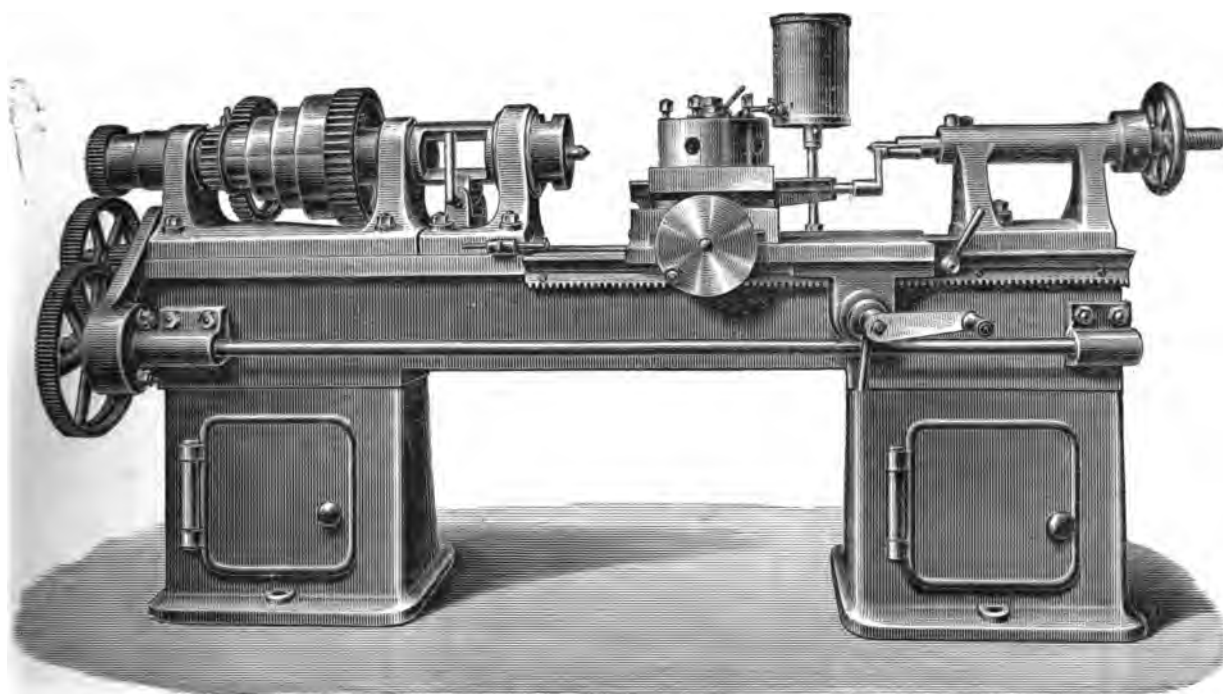


Fig 1.

side of the vertical, so that it may be easily set for cutting wheels to be operated by worms of almost any pitch; also for trimming the sides of bevel gear teeth, when set over at any angle. This machine is thoroughly well made throughout, and is a complete and very convenient machine, with all the adjustments required in modern practice, performing all classes of gear cutting with accuracy and despatch, and has given full satisfaction wherever used.

Messrs. Selig, Sonnenthal & Co., 85, Queen Victoria Street, and Lambeth Hill, London, E.C., are the sole European Agents for the D. E. Whiton Machine Company, of New London, Connecticut, U.S.A.

dynamos, &c. The greatest interest in the firm's stand is, however, centred in the large number and variety of engineers' machinery, of which we propose to give a brief enumeration, illustrating some of the principal.

There are three lathes suitable for various engineering work. One is an ordinary screw cutting and turning lathe, 6 ft. 6 in. distance between centres, 10 ft. length of bed. Another, which we illustrate in Fig. 1, is specially adapted for stud and bolt turning, distance between the centres 2 ft. 4 in., and weight of the machine 1,800 kilogs., or about 3,960 lbs. The lathe head shafting is hollow, and is double-gear; the chuck is so constructed as to permit the instantaneous centring and fixing of bars, or other material from  $\frac{3}{4}$  in. to 2 in. diam. A turret tool rest, it will be seen, is fitted; it carries five tools of different kinds, and all other ordinary requisites are provided. The shafting

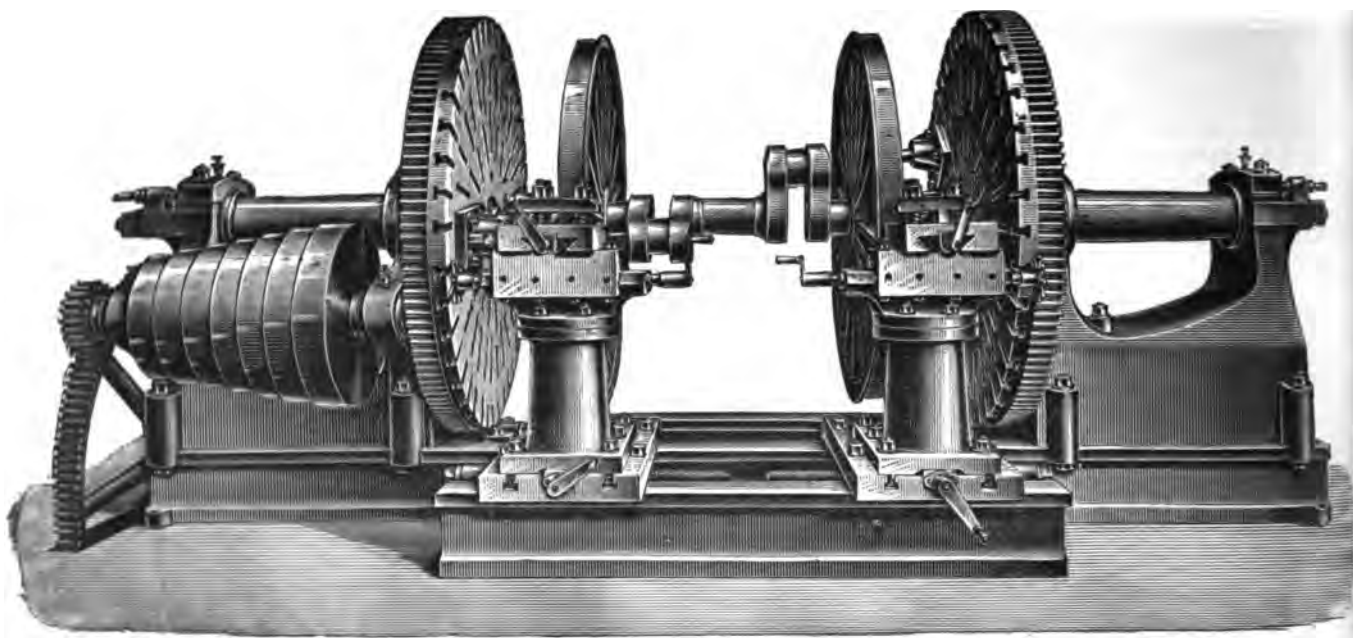


FIG. 2.

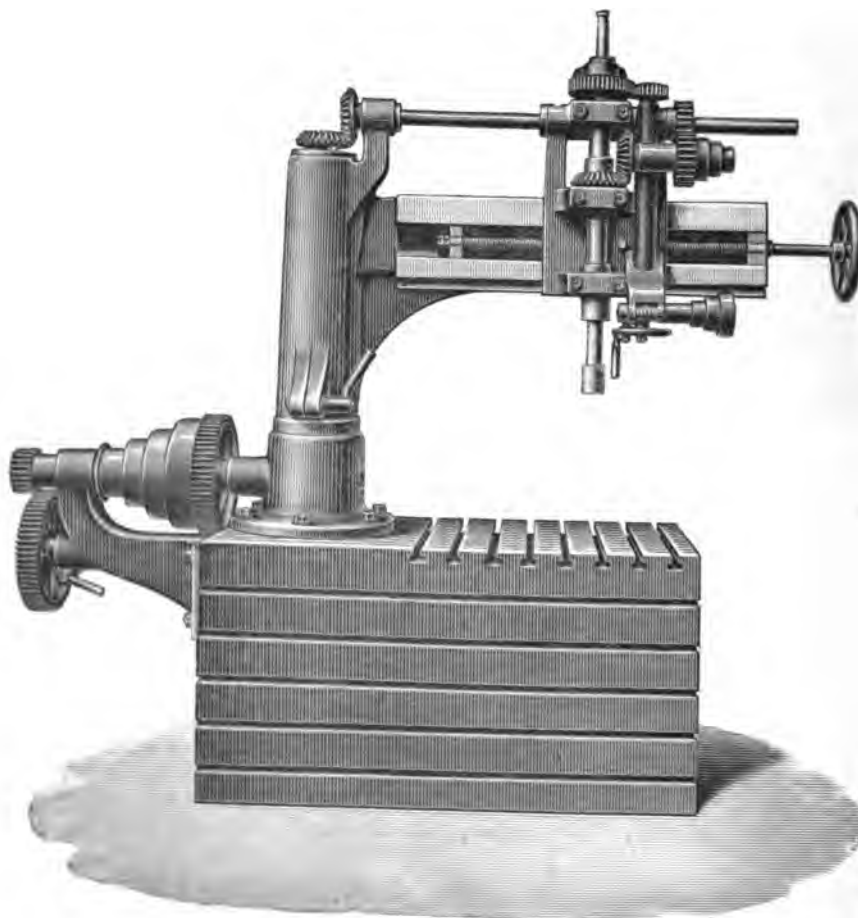


FIG. 3.

and the worm screw are constructed of steel, and the gearing accurately divided and cut by machinery.

The third lathe exhibited by the firm is of the crank shaft type, but of a size only suited to smaller marine engineer or ordinary locomotive work. In our illustration (Fig. 2), the driving wheels and crank-shafting of a locomotive are shown under operation. Two tool rests with automatic feed gear, longitudinal, vertical,

plicated parts, and evidently being carefully constructed, it is a good specimen of machine-tool construction.

Next we noticed two drilling machines of ordinary construction, one of which is single and the other double geared, the latter having a table movable by hand, vertically and horizontally. The other drilling machine is of the column type, with a vice at one end of the cross table and a tablet on the other.

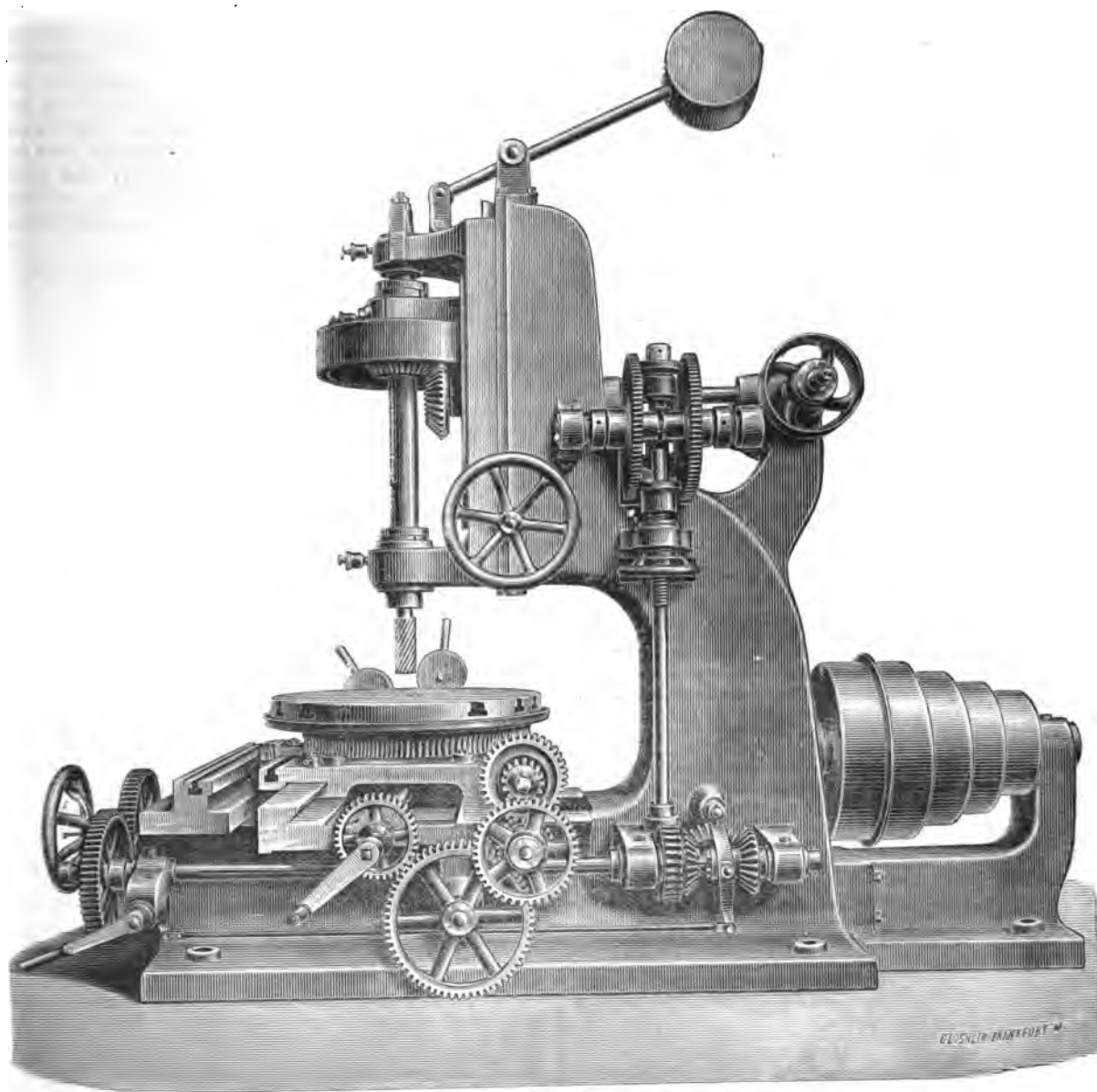


FIG. 4.

and oblique, so arranged as to be easily controlled, are of modern construction. It will be seen the driving gear consists of seven cones, giving great variety of speed. This lathe can also be utilised for drilling and boring centres, &c. The shafting is of steel, with gun-metal bearings. The screw gearing has been cut and divided accurately by machinery, and, along with all working parts, is of steel of the best quality. Having no com-

A radial drilling machine exhibited, we illustrate in Fig. 3. As will be seen, the table is slotted on all sides across the top, so as to hold work of various descriptions, the radial arm being arranged to describe a complete circle, and is fitted with single and double gearing, self-acting drill feed and other recent improvements. Drilling can be effected by this machine on radii of from 18 in. to 5 ft. A similar machine is

also exhibited, having the radial arm, moving also in the vertical direction and horizontally, the movement being limited to 180 degrees. As in all the tools exhibited by this firm, steel enters largely into their construction.

Two cold sawing machines of different sizes, both with specially heavy framework, and provided with emery grindstones for sharpening the saw blades, as well as ordinary outfit, are exhibited by Messrs. Ant. Fetu-Defize et Cie., as are two shaping machines, one equipped with two, and the other with one, raising and lowering table, with fixed screw-jack underneath, and having automatic feed on both transverse and vertical motions.

Four shaping and finishing machines, each designed for specific work, are also on view. The largest one has a movable table, working on rack, but provided with quick-return action, capable of planing horizontal, vertical, and oblique surfaces. A smaller one is designed specially for finishing the guides of locomotive pistons by means of emery wheels, and has only horizontal action, and the smallest ones are also specially constructed for a similar class of work.

Two slotting machines, of slightly different sizes and construction, one having a tablet with longitudinal, transverse and circular automatic motion, and the other automatic longitudinal and hand circular movement, are also exhibited—as also a punching and shearing machine, a feature in which, as in other machines of the kind exhibited by other foreign makers, is that of readily replacing the punch and bolster with shears, so that at one gap punching and shearing can be performed, but not simultaneously. Such a machine tool may be of utility in a small establishment, but is certainly not adapted for a ship-building yard, well supplied with work. This machine has heavy gearing for its size, and arranged to be driven off shafting by a belt.

The last of the exhibits we notice of Messrs. Ant. Fetu-Defize et Cie., and one of which we illustrate in Fig. 4, are two milling machines. The one illustrated has a vertical action, and is fitted with radial table, having self-acting transverse longitudinal and circular motion, with reversing gear, &c., complete. Another exhibited, with double gearing, is capable of either drilling or milling, horizontally, the table having longitudinal and transverse motions. As in all the machines exhibited by the firm of Ant. Fetu-Defize et Cie., steel of the best quality is used in the construction of the shafting and other working parts. All the castings are of first-class quality, and throughout every care has been exercised in obtaining accurate and highly finished workmanship.

### PARIS EXHIBITION.

MESSRS. GEORGE ANGUS & COMPANY'S, LIMITED, EXHIBITS.

**A**LTHOUGH there are but few British exhibitors of leather, india-rubber, asbestos, and similar articles used by engineers, mill-owners, &c., those firms which are represented have certainly been determined to eclipse all foreign rivals by the completeness of their exhibits.

This is especially true of Messrs. George Angus & Co., Limited, St. John's Works, Newcastle-on-Tyne; Dale Street, Liverpool; Bute Docks, Cardiff; and 15, Wallbrook, London, whose manufactures have such a wide and deservedly high reputation. The original firm of George Angus & Co. was established in the last century—viz., in 1790—and at first their attention was solely directed to the leather trade. Ultimately, when the various uses of india-rubber became known, the manufacture of various engineering and other requisites of that material was added to the business, and in the course of a few years their operations became more extensive than any firm engaging both in the leather and india-rubber manufacturing processes. Last year, following the tendency of the age, as regards large industrial concerns, the firm was converted into a limited liability company, the senior partner of the old firm becoming chairman, and four of his sons undertaking the management of the various departments.

A glance at the large stand of Messrs. George Angus & Co., Limited, which is situated in the Gallery of the Palais des Machines, gives some idea of the variety of articles they manufacture. The many samples of belting, hose, packing, sheeting, &c., exhibited, however, preclude an exhaustive and detailed account of everything on the stand, which has an ornamental office in the centre, and is surrounded by handrailing.

The exhibits of leather goods are, however, specially deserving of notice—comprising as they do best oak-tanned leather belting, hose pipes, harness and bellows' hides, fire-buckets, &c., and as the company is probably the most extensive operators of leather in the United Kingdom, supplying the wholesale trade, some faint idea of the extent of their operations may be obtained from the fact that Messrs. Geo. Angus & Co. have repeatedly secured the contract for supplying leather hose piping to the British Navy, and have been entrusted with it for the current year—a contract requiring in its execution over 5,000 hides of leather. For many years special attention has been given to the preparation of hydraulic ram cup leather, necessitating extensive special plant. The large ring in front of the stand, together with the cups in a pyramidal pile, and the numerous rings attached to the end and sides of the "kiosk" or office, permits the visitor to see the success which has been attained in this branch of Messrs. Angus & Co.'s manufactures, a success which has been testified to by numerous testimonials from all quarters of the world, speaking of the durability and careful manufacture of the hydraulic cup rings. The large belt exhibited has been manufactured to the order of Sir W. G. Armstrong, Mitchell & Co., Limited, Newcastle-on-Tyne, and is one of a large number supplied to this renowned company, and is a splendid specimen of workmanship well worthy of close inspection.

The exhibits of cotton belting are also of great interest—large quantities of which are exported to the British colonies and foreign countries—as are also the india-rubber beltings shown in great variety, as specially manufactured for paper mills, collieries, &c., where the variations in temperature are unsuitable to leather belting.

In specialties for marine and land engines a great

variety of articles are exhibited. The india-rubber valves and vulcanised fibre valves in many sizes, as used by the leading steamship companies both at home and abroad, show evidence of great care in the preparation of the material, and the same remark holds true of the numerous samples of steam packing exhibited—adapted to various requirements. In this department Messrs. Geo. Angus & Co. are justly renowned for the absolute uniformity in the quality of their engine packing, more especially of that prepared for compound engines, and for triple-expansion

## PARIS EXHIBITION.

### THE EXHIBITS OF THE SOCIÉTÉ COCKERILL.

THE famous Belgium Company, La Société Cockerill, although it has not such varied and numerous exhibits as it had at the Antwerp Exhibition, when it was represented by one set of compound triple-cylinder twin-screw engines of a Russian warship, capable of indicating about

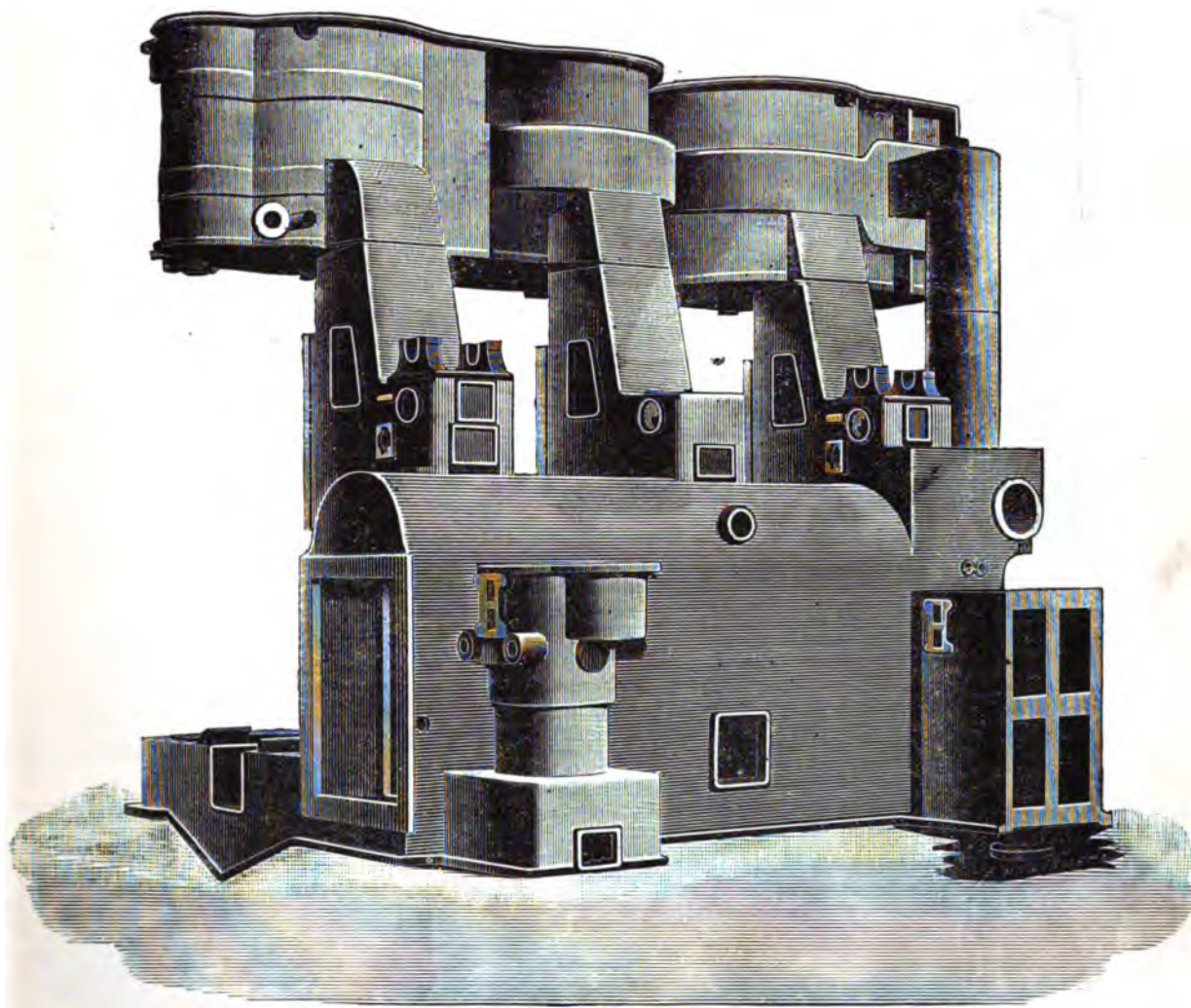


FIG. 1.

engines—the latter formed of asbestos and lead wire. Delivery and suction pipes, canvas, fire hose and fittings of every description are also exhibited in great variety.

**FAST STEAMING FROM THE CAPE.**—The Union Steamship Company's Royal Mail steamer *Tartar*, which left Cape Town at 5.42 p.m. on October 2nd, arrived at Southampton at 8.50 a.m. on Sunday, the 20th, her gross passage being 17 days 15 hours 8 minutes, and her nett steaming time 17 days 10 hours 28 minutes. The distance run was 5,979 miles, giving an average speed of 14.3 knots per hour over the whole course.

10,000 H.P., kept in motion by compressed air: a complete triple-expansion engine and boiler for a large deadweight carrying mercantile steamer, besides winding and blowing engines of the largest size, &c., still its exhibits at Paris are notable, one of them having very specially the feature of novelty.

We refer to the large casting of a triple-expansion engine, of which we give two illustrations—Fig. 1 showing a back, and Fig. 2 a front view. As can be readily understood, this casting has been made pure—

with the intention of showing to what perfection the work of pattern makers, moulders and founders can be brought. Those of our readers who have, as the writer has, been privileged to see it, will acknowledge that it is a magnificent achievement, all the more in that it has only been cleared of the moulding sand, and has not been dressed in the slightest degree by hammer, chisel or file. It is certainly the most unique casting of a marine engine ever manufactured, and reflects every credit upon those who have conceived and executed the work.

wrought-iron front columns—will further assist our readers to understand the complicated nature of this casting.

Our illustrations are reproductions of photographs of this exhibit; but photography fails to show the internal construction, the steam and exhaust passages, &c.; for although the casting is only exhibited as a specimen of foundry work, and in nowise as for practical utilization, still in no part of it is there dummy work—only the moving parts, the cylinder covers, plummer blocks, caps, brasses and front

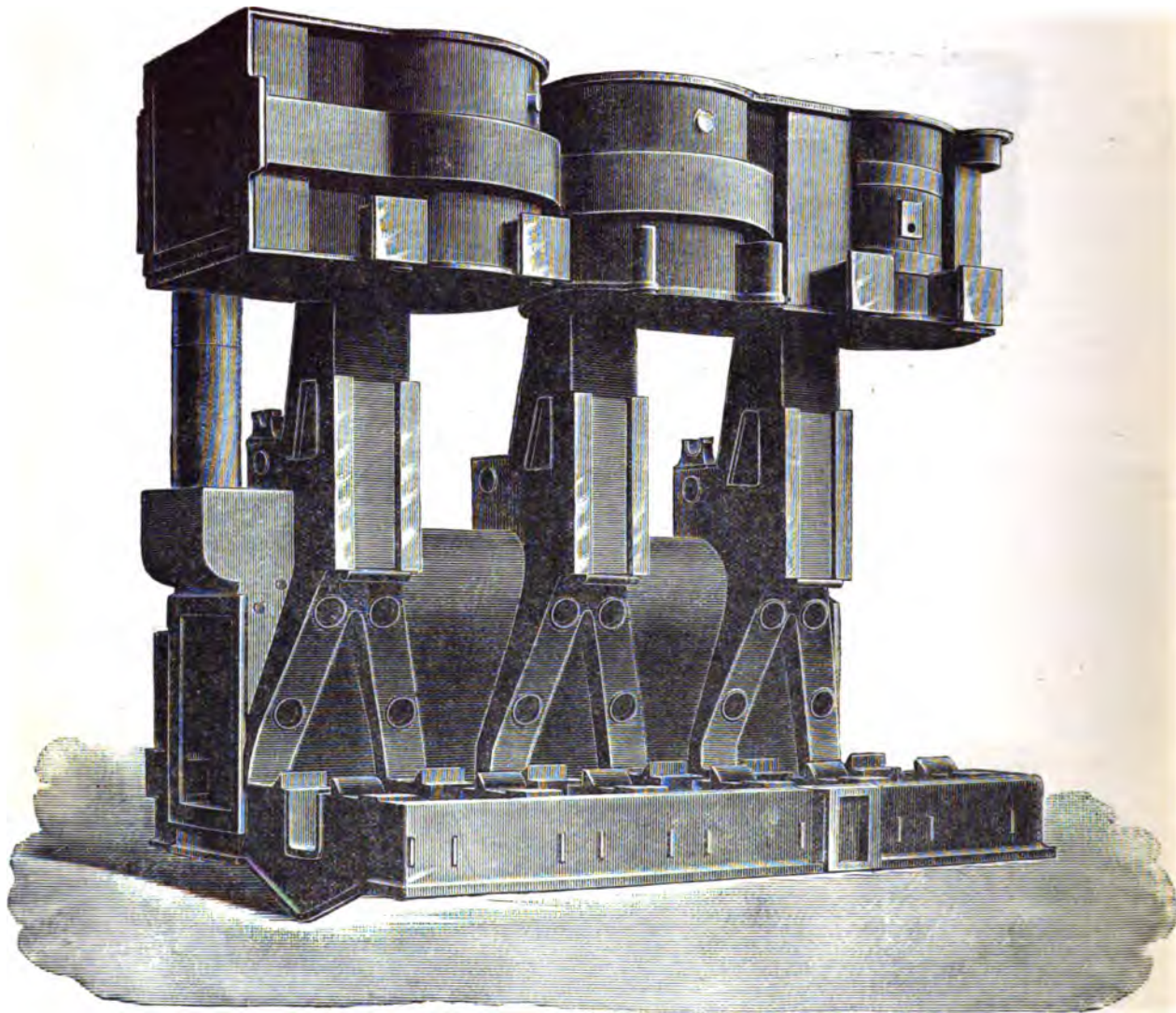


FIG. 2.

As will be seen from Fig. 1 the three cylinders, each with a back column, and the plummer blocks for carrying the levers for working the pumps, are cast on the condenser; the air and circulating pumps, with their valve boxes, and the exhaust steam pipe from the low-pressure cylinder to the condenser, also forming part of the casting. Fig. 2, showing the bed plate, with crank shaft bearings, the slides on columns, and the front view of the cylinders—which are provided with snugs for securing the

columns are wanting to make it a complete triple-expansion engine of about 500 I.H.P.

This remarkable casting weighs over 10 tons; not that the weight is a great criterion of its importance from a constructive point of view. Only those who have had large experience with complicated foundry work are capable of fully gauging the labour, the skill and the care that has been exercised in its production. It is its complexity that renders it specially noteworthy.

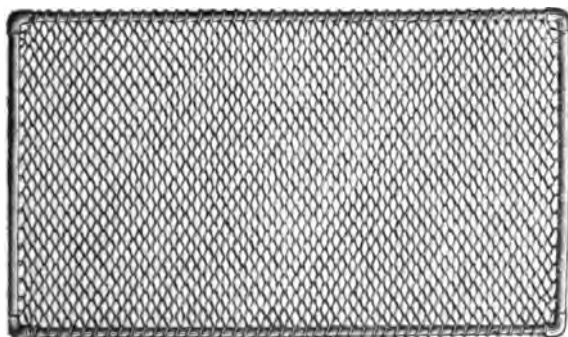
To M. Résimont Père, chief manager of the foundry department of the Société Cockerill at Seraing, is due the credit of proposing to construct such a novel exhibit, and to him is also largely owing the successful carrying out of the undertaking.

Besides this casting, the Société Cockerill have two very important exhibits, viz., a large vertical compound blast engine, and an air-compressing engine; but pressure on our space precludes a description, as although they are amongst the most striking exhibits of machinery in the Palais des Machines, they are not of special interest to our readers.

### NEW STEEL MAT.

THE Sphincter Grip Armoured Hose Company, Limited, have introduced an improved patent clamp steel wire mat which calls for some little notice, and of which we now give an illustration.

Its great novelty lies in its construction, which consists of galvanized steel spring coils of the well-known Sphincter Grip Armour, intertwined and locked together, forming the body of the mat, and dispensing altogether with the cross or diagonal wires which are introduced into other systems, and which not only add very considerably to the weight of the mat, but also obstruct the free passage of dirt, and consequently reduce its effective working for the purpose for which it is intended.



The coils, or body, of the mat are firmly secured to a frame, which consists of four strong tubular steel pipes, to which the end of the coils are clamped and adjusted in such a way as to render stretching or contraction simply impossible.

The mat is self-cleansing, and no taking up, shaking, or beating is required, as after use the dirt drops through on the floor, and may be swept away at any time simply by raising the mat.

It is, of course, primarily intended for a door mat, but it seems well adapted for use on board steamers, &c., and is made in sizes from 18 x 12 to 42 x 30 in., but mats of any dimensions can be made to order, and may be had nickel plated at, we believe, a small extra cost.

YOKOHAMA HARBOUR.—A mail from Japan brings information that the great works for the improvement of Yokohama Harbour are about to be commenced, instructions to that effect having been received by the local authorities from the Cabinet, General Palmer, R.E., Consulting Engineer to the Government, having the direction of the works.

### THE ITALIAN CRUISER "PIEMONTE."

THE Italian cruiser *Piemonte*, which sailed from the River Tyne on the 5th October and arrived at Spezzia on the 15th ult., forms the subject of our two-page supplement illustration, which is the reproduction of an instantaneous photograph taken when the vessel was steaming during her trial trip. This vessel is the latest and most successful representative of the protected cruiser class, the construction of which has been so strongly advocated by Lord Armstrong for several years. The chief features of these vessels have been briefly defined by the head of Sir William Armstrong, Mitchell & Co., Limited, as "great speed and nimbleness of movement, combined with great offensive power," and "little or no side armour, but otherwise constructed to minimise the effect of projectiles." The designer of the *Piemonte*, Mr. P. Watts, principal manager of the Elswick shipbuilding department, sought to develop these features as much as possible, within certain well-defined limits, the displacement not to exceed 2,500 tons, and the speed not to be less than 21 knots per hour, and every credit is due to the designer of the vessel and constructors of the machinery for having fully complied with these conditions. In a comparison of the respective displacements of vessels of this protected cruiser type previously built at Elswick, in the October number of the *MARINE ENGINEER*, page 257, we claimed that the higher speed obtained (on a smaller displacement than the *Esmeralda's*, *Naniwa's*, &c.) in the *Piemonte* was evidence of "great progress in naval architecture and marine engineering," but another leading feature demands notice, viz., that owing to the adoption of the new Elswick quick-firing guns, the vessel is capable of discharging in a given time twice the weight of shot and shell that could be fired by the largest war vessel now afloat; and it is worthy of note that the *Piemonte* is the first vessel that has been equipped with this latest improved type of ordnance.

Some particulars of the vessel have already appeared in our columns, but it may be convenient to state them more fully. The *Piemonte* is 300 ft. in length, 38 ft. breadth, moulded, and has 14 ft. draught of water forward, and 16 ft. at the after end, with a displacement of 2,500 tons. The weights of the complete vessel are as follows:—

	Tons.
Hull and fittings . . . . .	970
Protective material . . . . .	280
Equipment . . . . .	130
Machinery and spare gear . . . . .	720
Coals normal . . . . .	200
Armament . . . . .	200
	<hr/>
	2,500

A protective deck is fitted from stem to stern with sloping sides, the latter being 3 in. thick, and the middle part of the deck 1 in. thick. As will be seen from our illustration the vessel has a full poop and topgallant forecastle, and is rigged with fore and main military masts—the boilers placed forward of amidships having two funnels. Forward of the fore mast is the conning tower protected with 3 in. plates, and a bridge for the officers when the vessel is not in action.

The armament consists of six 6 in. and six 4½ in. Elswick quick-firing guns, the former capable of piercing 15 in. armour, and the latter 10½ in. armour of wrought iron, besides ten 6-pounder Hotchkiss guns, six 1-pounder Hotchkiss guns, four 10-millimetres Maxim guns, and three torpedo tubes. The large quick-firing guns are provided with steel armour 4½ in. thick for protecting the gunners, and all of the other guns carry light shields for the same purpose. The armament is so designed and arranged that the greater portion of it can be brought to bear upon either broadside.

The engines and boilers, which were constructed by Messrs. Humphrys, Tennant & Co., Deptford, are placed wholly below the water-line and protected by the armour deck, as are also the steering gear, magazines, &c., coffer dams rising 4 ft. above the water around all apertures through the armour deck requiring to be open in time of action. The hull is also sub-divided by numerous watertight bulkheads, both above and below the armour deck, each set of engines and each pair of boilers being in a separate compartment, there being thus two distinct engine-rooms and two boiler spaces. The coal bunkers are at the side of the vessel throughout, the engine and boiler spaces and the bunker fore and aft bulkheads, forming an inner skin, are continued forward and aft as sides of the magazines, &c.

The engines are of the triple-expansion type, each set consisting of four cylinders, viz., high pressure, 36 in. diameter; intermediate, 55 in. diameter; and two low pressures, 60 in. diameter, all working on separate cranks, the uniform length of stroke being 27 inches.

There are four double-ended boilers of 155 lbs. working pressure, to which forced draught can be supplied by eight fans, the stokeholes being, however, suitably arranged for either natural or forced draught. The guaranteed speed of 21½ knots under forced draught was greatly exceeded in the official steam trial, at which a speed of 22.3 knots was attained with a development of power of 12,700 horses. The natural draught trial was equally satisfactory, a speed of 20.44 knots being realized, during a continuous run of six hours' duration, with an average of 7,100 I.H.P. This natural draught performance is extremely good, inasmuch as the speed realized is more than three-quarters of a knot greater than the average speed of the *Medea* class under forced draught, and nearly half a knot greater than the speed which is contemplated in the 9,000 ton cruiser, *Blenheim*, under the same conditions of natural draught.

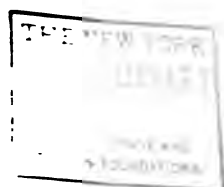
On the passage from the Tyne to Spezzia the *Piemonte* encountered heavy gales in the Channel and in the Bay of Biscay, and it is eminently satisfactory to learn that she proved to be a splendid sea boat. There is also no doubt her manœuvring capabilities are almost everything that could be desired, the cutting away of the after deadwood and the fitting of a large balanced rudder, in front of which the deadwood is also removed, having ensured this important feature; and when all the qualities of the vessel are considered, including the capability, with a full supply of coals in the bunkers, which have a capacity of 600 tons, of maintaining a cruising speed of 10 to 12 knots for 55 days, during which time a distance of

about 13,500 knots could be made, it is evident that in the *Piemonte* the Italian Government have secured an important addition to their Naval force, and the designers and constructors have scored a great success.

### THE LOFTUS-ANGIER LAMP.

A NEW departure in ship's lamps has lately been tested on board the s.s. *Fez*, lying in St. Katherine's Dock, with results highly gratifying to the inventors and the shipping community generally. The power of projecting the rays of light to the greatest possible distance is the most important condition a ship's lamp should fulfil. To do this the lamp must have a lens of a high order, and of course at a heavy expense, which is an object in the mercantile marine, and still more so to the poorer owners of fishing vessels. To meet the case, as well as to furnish a good penetrating light, the Loftus-Angier has been invented. In this new lamp the solid transparent lens gives place to a hollow lens containing glycerine, red and green, for port and starboard lights respectively. In addition to this Captain Loftus has invented a burner and a reflector, which still further increases the effectiveness of the light. At the test already mentioned the first lamp tried was a side lamp in which the lens was filled with pure glycerine, a green glass being placed between the lens and the burner. In this trial the photometric test showed 29 candle-power. An ordinary regulation green side lamp was then tried, and gave 18½ candle-power as a result. The lamps showing a red light were then tried, and likewise showed improved photometric results in favour of the glycerine lamp. The next experiment was with a Loftus-Angier lamp, having the glycerine itself coloured green and fitted with the Loftus special burner and reflector, the result showing an 80 candle-power in direct focus, and 52 candle-power at the side. The same lamp with the ordinary burner and reflector developed 32 candle-power in direct focus. In these tests the comparison has to be made between the ordinary regulation side lamp, giving 18½ candle-power, and the coloured glycerine side lamp with the improved burner and reflector, which indicated 80 candle-power, as the latter is the lamp which it is proposed shall supersede the former for the service, and which, it is said, costs less than the ordinary lamp.

Captain Loftus, who is engaged with further tests at the works of Messrs. Ridsdale & Co., 54, Minories, London, where the lamps are made, informs us that the tests were made under somewhat unfavourable circumstances on board the *Fez*, the ship having a list, and the photometer being wedged in an awkward corner, and that the tests taken at the works gave a far greater range of difference in favour of the new lamp than was obtained in the *Fez* experiments. There can be no question that the glycerine lamp, particularly with the special burner and reflector, is a great advance upon the regulation lamp, and it is about to undergo a searching series of tests at the hands of the Trinity House authorities.

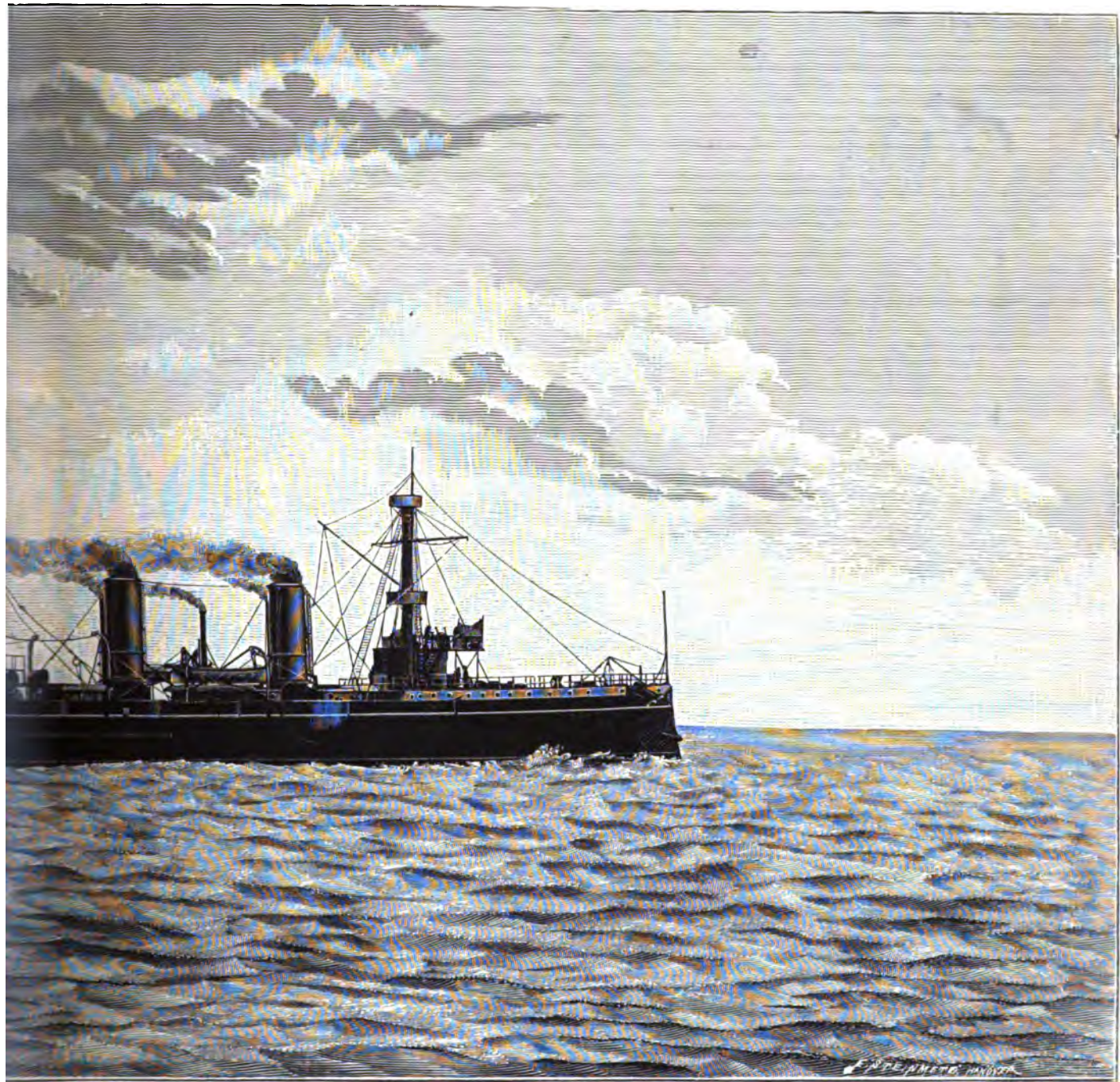


THE "MARINE ENGINEER." ]

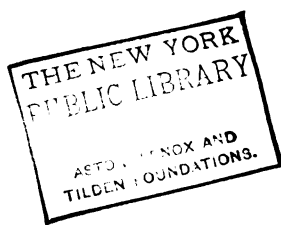


THE ITALIAN CRUISER "PIEMONTE." CONSTRUCTED

[NOVEMBER 1ST, 1889.]



AT ELSWICK BY SIR WM. ARMSTRONG, MITCHELL & CO., LIMITED.



## THE PAMPHLETT-FERGUSON FRESH-WATER CONDENSER AND FEED MAKE-UP.

THIS apparatus, which promises well for use on board ship, has recently been invented by Messrs. Pamphlett & Ferguson. It can be used as a combined evaporator and condenser for producing fresh water from sea water, or from impure water obtained from any source; or it can be used as a simple condenser to produce fresh water from steam evaporated in another boiler.

It is the outcome of the experience of an engineer who has had most exceptional opportunities of acquiring a thoroughly practical knowledge of this class of machinery, and with almost every known apparatus in use for condensing purposes. The apparatus occupies an area of about 6 ft. by 5 ft., and is about 4 ft. 6 in. high, including all the necessary pumping arrangements, and can produce 50 gallons of distilled water per hour.

The object aimed at has been to produce a reliable, simple, easily managed, and easily repaired piece of machinery that can be tested in detail as to tightness of tubes, &c., and then put together with confidence that it will produce fresh water without priming, even with high-pressure steam. In this distiller the supply of water is of course primarily drawn from the sea, and the bulk is used for the purposes of cooling and condensation in the apparatus itself. About 25 per cent. of the circulating supply is drawn from the main bulk for distillation, and for this purpose is conducted to the evaporator, where it passes through a nest of vertical tubes, round which steam at high pressure from the boiler circulates. From the evaporator the vaporized water passes to the condenser, and is afterwards conducted to the combined cooler and filter, in which the fresh water is aerated, air being pumped into the cooler with the water.

We hold over till our next number a detailed and illustrated notice of this invention, but we may mention now that one feature in this apparatus is that evaporation is effected under a vacuum so as to reduce the deposition of solid matter to a *minimum*, and also to avoid as much as possible the unpleasant taste and odour of water distilled at a high temperature. A second feature in the working of this condenser is the prevention of priming. This is effected by causing the steam to travel in a circular path, and in connection with baffle plates. But perhaps as important a feature of any is the fact that all tubes are ordinary condensers or copper tubes, and that no ordinary accident or damage, arising from wear and tear, that can happen but can easily be made good by the engineer on board ship in the course of a few hours. From four to six hours would suffice to take apart and test, by hydraulic pressure, every part in which leakage could be of any consequence.

The whole of the experiments were entrusted to Messrs. H. Ferguson and G. H. Wailes, A.M.I.C.E. and M.I.M.E., who have worked at the apparatus for eighteen months, meeting and solving, during this period, many difficulties in securing, as they have now done, such a reliable apparatus giving 94 per cent. of efficiency. A demonstration of this apparatus recently took place at the works of the manufacturers, Messrs. George Wailes & Co., 258, Euston Road, London, when

several marine and other practical engineers were present, and its efficiency has been exhaustively tested by Mr. Maxwell Williams, C.E., whose report we will give with the detailed notice next month.

## NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from September 26th to October 24th, 1889:—

Abbott, Henry, engineer to the *Scout*, to date October 3rd.  
 Allen, Henry J., assistant engineer to the *Skipjack*, to date October 2nd.  
 Alton, George Baltic, chief engineer to the *Tartar*, to date October 22nd.  
 Andrews, Wm. J., chief engineer to the *Conquest*, re-appointed on promotion, to date October 29th.  
 Aston, Samuel, engineer to the *Jackal*, to date October 3rd.  
 Bearlock, Chas. W. J., assistant engineer to the *Trafalgar*, to date October 17th.  
 Bishop, Thos. H. B., assistant engineer to the *Scout*, to date October 3rd.  
 Bryant, Chas. W., assistant engineer to the *Camperdown*, to date October 17th.  
 Carnt, Albert J., engineer to the *Trafalgar*, to date October 17th.  
 Cooke, George Henry, chief engineer to the *Tyne*, to date October 22nd.  
 Crichton, Peter T., assistant engineer to the *Melpone*, to date October 2nd.  
 Cummings, Geo. R. T., engineer to the *Scout*, to date October 3rd.  
 Davis, Wm. P., fleet engineer to the *Collingwood*, to date November 7th.  
 Edwards, Wm. F., assistant engineer to the *Euphrates*.  
 Forster, Archibald T. V., fleet engineer to the *Hydra*, to date October 2nd.  
 Hardwicke, Wm. W., assistant engineer to the *Conqueror*, to date October 2nd.  
 Herbert, Robert K., engineer to the *Northampton*, to date October 2nd.  
 Hicks, John, engineer to the *Mistletoe*, to date October 3rd.  
 Hines, Wm., chief engineer to the *Wizard*, re-appointed on promotion, to date September 30th.  
 Hobbs, Philip, assistant engineer to the *Basilisk*, to date October 4th.  
 Hockan, Wm. T., engineer to the *Lizard*, to date October 6th.  
 Hyde, Thos. Hobbins, chief engineer to the *Asia*, additional, to date October 22nd.  
 Irwin, Richard, staff engineer to the *Royalist*, to date October 6th.  
 Irwin, Wm., engineer to the *Sultan*, to date October 2nd.  
 Jackson, Edward, chief engineer to the *Mersey*, to date October 22nd.  
 Jackson, Ronald E., assistant engineer to the *Collingwood*, to date November 7th.  
 Johnson, John, fleet engineer to the *Gordon*, to date October 2nd.  
 London, Arthur J., chief engineer to the *Landrail*, re-appointed on promotion, to date October 4th.  
 Ludgate, Wm. G., assistant engineer to the *Hero*, to date October 2nd.  
 Moysey, Alfred H., assistant engineer to the *Collingwood*, to date November 7th.  
 Mullinger, Wm. James, chief engineer to the *Melita*, re-appointed on promotion, to date October 3rd.  
 Murray, Geo. W., assistant engineer to the *Collingwood*, to date November 7th.  
 North, Caleb John, chief engineer to the *Pembroke*, additional, to date October 22nd.  
 Percy, John J. G. G., assistant engineer to the *Hecla*, to date October 2nd.  
 Sercombe, Francis J., assistant engineer to the *Trafalgar*, to date October 17th.  
 Simmons, Geo. T., chief engineer to the *Hearty*, re-appointed on promotion, to date October 8th.  
 Skinner, Wm. Henry, chief engineer to the *Immortalite*, to date October 22nd.  
 Spalding, Andrew, staff engineer to the *Warspite*, to date October 22nd.

Thompson, Jas. M., engineer to the *Collingwood*, to date November 7th.  
 Walton, John, engineer to the *Egeria*, to date October 8th.  
 Winney, Henry T., assistant engineer to the *Monarch*, to date November 7th.  
 Wood, Wm. H., assistant engineer to the *President*, additional, to date September 30th.  
 Yeats, Henry T., engineer to the *Galatea*, to date October 6th.

## HOAR & BROWN'S HARDWOOD MARKET REPORT, October 24th. 1889.

**TRAK.**—The deliveries for the four weeks ending the 18th October were 1,440 loads, and for the nine months of the year ending 30th September, 11,229 loads, against 12,440 loads in 1888, and 7,683 loads in 1887.

The stock on the 1st October was:—

1889.		1888.		1887.	
Logs.	Planks.	Logs.	Planks.	Logs.	Planks.
Moulmein 2,264 Lds.	879 Lds.	3,611 Lds.	924 Lds.	7,705 Lds.	266 Lds.
Rangoon 1,805 " "	812 " "	1,661 " "	875 " "	1,075 " "	850 " "
Bangkok 1,375 " "	270 " "	1,286 " "	286 " "	2,536 " "	824 " "
Totals	5,484 Lds.	1,461 Lds.	6,508 Lds.	1,586 Lds.	11,316 Lds.
					960 Lds.

A steady market still prevails, and enquiries are numerous. The shipbuilders continue busy, and their requirements are fairly heavy. In addition the railway carriage builders are more actively employed than usual, and their engagements are likely to increase.

Prices are very firm, with no prospect of any fall at present.

**GREENHEART.**—The stock is 106 loads, against 338 loads in 1888, but there is little business doing in this article.

**MAHOGANY.**—The market is firm, and prices remain high throughout the kingdom. The importations are moderate, and the demand fairly brisk. Higher prices are expected before the close of the year, in spite of the large exports reported from Honduras.

**CEDAR** is decidedly weaker, and the old figures are expected to rule before many weeks are past.

**WALNUT-LOGS.**—A large clearance has been made lately in consequence of the entire stock of a shipper being put upon the market and realised. This action will clear the atmosphere, and better business than of late is expected; although trade is still somewhat restricted by the inferior character of the wood of which the stocks are principally composed. Good parcels would realise high prices.

American imported cut planks and boards of superior character are meeting with a ready sale at advanced prices; but the fact of the market being glutted with inferior parcels tends to depress prices for this class of wood.

**SEQUOIA**, this month, has only been moving off slowly; but orders are in perspective which will relieve the market considerably. Several new branches of the trade are giving this wood a trial to test its suitability to replace pine, the price being considerably lower.

## ANGIER BROTHERS' STEAM FREIGHT REPORT, October 19th, 1889.

**FREIGHTS** during the past fortnight have been generally active, at a substantial rise in rates all round with very few exceptions. The China trade maintains its dullness, and the Australian demand has fallen off. From India some business has been done at fair rates, and more tonnage is wanted from the Burmah rice ports for next season, also from Calcutta, Madras Coast, Malabar Coast, Bombay, and Karachi. The Black Sea trade has been and continues good at a rise of about 6d. to 9d. per gr., the best rates having been paid from Azoff. Mediterranean employment is better. Baltic business is restricted, but steamers command a proportionate rise in rates thence, the season being now well advanced. The American market has for some time been the strongest, and rates thence have steadily advanced for cotton grain and general cargo, both for prompt tonnage and more distant loading, some engagements having been made for February loading. A good number of boats have been taken on time charter for this trade coasting and Atlantic. The Brazils offer little home-  
 movement, but from the River Plate the late improve-  
 maintained, and a few orders exist for steamers

on time charter for this trade. Outward coal and iron rates have been sustained to Mediterranean ports and South America, and for India and far East rates are firmer with a fair demand. Coal prices are very firm and dear; stores and wages are also higher, and promise to keep up for some time.

Prices of steamers have further advanced, and a number of transactions have taken place for new as well as second-hand steamers. Labour and materials continue to advance without any visible prospect of a check for some time to come.

## INDUSTRIAL AND TRADE NOTES.

### THE CLYDE AND SCOTLAND.

**DURING** the latter part of September and early days of October, extreme activity in the launching of vessels characterised the shipyards of the Clyde. From the 25th to the 28th September, inclusive, as many as 12 vessels were consigned to the water, most of them being of considerable size; the tonnage aggregating over 21,000 gross. On one day alone as many as five vessels were put off the stocks, the total tonnage amounting to 10,250.

The receipt of fresh orders is in passable measure commensurate with this brisk rate of production; but the feeling begins to gain ground that continuation of the lively demand which has so long existed can only be for a moderate period longer. Meantime, however, all the firms continue to be taxed to their utmost in producing vessels within the contract periods. The sluggish supply of material, and the non-fulfilment of sub-contracts, continue to exercise the patience and temper of shipbuilders and engineers, while the behaviour of workmen, to say the least, in no way helps to alleviate matters.

Since last month's report was made, a goodly number of new contracts have been entered into. The most important of these is one entered into by Messrs. R. Napier & Sons, Govan, to supply the Government with one of the three first-class cruisers which have meantime been given out to private builders. These vessels, of which six are ultimately to be constructed, are each 7,800 tons displacement, and their engines are to indicate 12,000 H.P., giving the vessels a speed of 20 knots on the measured mile. They have heavy protective decks, and powerful armament. In point of size and equipment, the vessel of next importance ordered is one of over 3,500 tons gross, which Messrs. Trinder, Anderson & Co., acting for Messrs. Elder, Smith & Co. (Limited), have entrusted to Messrs. Napier, Shanks & Bell, of Yoker. The new steamer will be 305 ft. in length, 40 ft. in breadth, 22-8 ft. depth of hold, and will steam 14½ knots at sea. She will have very extensive accommodation for passengers, and will form an important addition to the fleet of the Adelaide Steamship Co.

Messrs. Robert Duncan & Co., Port-Glasgow, have contracted with Mr. T. C. Guthrie, Glasgow, for the construction of a large four-masted steel sailing ship which will form an addition to the "Village" Line. They have also contracted to supply a four-master of about similar tonnage for Mr. Robert R. Patterson, which will be a duplicate of the *Craigears*, built for him by Messrs. Duncan several months ago. It is worthy of remark, here, that quite a large number of sailing ships with four masts and of great tonnage are being built at the present time on the Clyde.

Messrs. Blackwood & Gordon, of Port-Glasgow, have secured the contract to build two schooners, each to carry 370 tons for the River Plate trade of Messrs. Allan, for whom the same builders launched the first of two small steamers on the 15th October. Messrs. Blackwood & Gordon have also contracted to supply a set of triple-expansion engines to indicate 1,300 H.P. for a steamer being built for Glasgow owners. The river steamer *Sultana* is presently in their dock, being fitted with a new paddle shaft and centre and having a general overhaul.

Messrs. John Reid & Co., Port-Glasgow, have been commissioned to build two saloon paddle steamers for service on the Clyde, in connection with the terminus of the Caledonian Railway at Gourrock. The new steamers will be similar in design to the *Caledonia*, built by Messrs. Reid & Co. this year for the same service. The *Caledonia*, it may be stated, was engined by Messrs. Rankin & Blackmore, of Greenock, and attained nearly half-a-knot in excess of her guaranteed speed, for which result Messrs. Rankin & Blackmore were awarded a premium.

For a steel screw steamer of 3,000 tons to be built at Belfast, Messrs. John & James Thomson, of Finnieston Engine Works, have contracted to supply triple-expansion engines of the most

approved type, to indicate 2,500 H.P. This firm, like all the others who are not themselves shipbuilders, have a difficulty in discharging all the work with which they are entrusted. Besides the engines on hand for new steamers, they have just about completed triple-expansion engines of considerable power for the s.s. *Waesland*, the fine old steamship which has done good service under the flag of the Red Star Line.

Messrs. David J. Dunlop & Co., Port-Glasgow, have contracted to build and engine a steel screw steamer of about 500 tons for Sydney owners. The vessel, which is for passenger and cargo service, will be supplied by the builders with triple-expansion engines of the most improved type.

Messrs. Gourlay Brothers & Co., of Dundee, have contracted with the National Steamship Co., Limited, to build and engine one of the two large cargo-carrying steamers which that company are about to add to their fleet.

Messrs. Russell & Co., of Port-Glasgow and Greenock, who have all their three yards in active operation, are experiencing trouble from the attitude taken up by their rivetters in insisting on a reduction in the number of apprentices employed in their Kingston shipyard. Some months ago the rivetters struck work on this account, but returned to their duties after two weeks or so had passed. The matter, however, has not ended here, for ever since, as the several squads finished their contracts, they have left the yard; until now, out of a total of 50 squads, only seven squads remain; the presumption being that they also will resort to the "boycotting" process when their jobs are finished. This action, it will readily be understood, places Messrs. Russell in an awkward position as regards the work they have on hand at Kingston. There are at present six large vessels under construction, aggregating 15,000 tons, and it is said that orders which might have been secured for this yard have gone to Continental builders, on account of the rivetters' action. The precise cause of the dispute seems to be that Messrs. Russell & Co. employ at Kingston 14 squads of apprentice rivetters, whereas the executive of the Ironworkers' Society wish them restricted to eight. Messrs. Russell said they meant to retain the 14 squads, but promised not to exceed that number.

These tactics are not the only and not the least warrantable means employed by the workmen's society to restrict the supply of labour. While Messrs. Russell & Co. have only been employing 50 squads of rivetters they could quite easily employ 70; but, it is alleged, that instructions have been received from head-quarters to the effect that 40 squads are sufficient for Kingston yard, and that the builders should restrict their output! The object of this is, ostensibly, that the men may have more continuous employment; but this unique way of controlling the shipbuilding market must strike many as being funny. The whole matter is engaging the attention of the Clyde Shipbuilders' Association, and will probably be brought before a conference of shipbuilders to be held in a few days at Carlisle.

Messrs. Steven & Struthers, brass founders, of Andiston Brass Foundry, Elliott Street, Glasgow, in common with many of the other firms who supply those multifarious subsidiary, but highly necessary, items which go towards completing marine engines, boilers and the hull of steamships, are at present extremely busy, and are likely to continue so for many months to come. They have been entrusted with the casting of the necessary stems, rudder frames, propeller shaft, brackets, &c., for six of the seventeen second-class cruisers of the *Medea* type presently being built in private yards throughout the kingdom. The resources of Messrs. Steven & Struthers' large works have been so taxed of late in supplying the demand for their well-known specialities in the shape of "syren" signals, organ whistles, lubricators, gauges, cocks, &c., that they have had to extend their works considerably. A new, commodious, and splendidly equipped foundry has just been erected, and the first work undertaken in it will be the important heavy brass castings for the Government cruisers referred to.

Messrs. T. S. McInnes & Cairns, of 56, Waterloo Street, Glasgow, are meeting with deserved success in the manufacture of the T. S. McInnes patent engine indicator, the superior merits of which are now widely recognised; and they are also busy with the manufacture of engine counters, clocks, pressure gauges, &c. This firm have arranged for a new and highly unique branch of their business, which is bound to prove of great service to engineering firms, shipowners, and others. This consists in most complete plant for accurate testing under steam pressure of engine indicators with their springs and gauges. A copper boiler with safety valve, loaded to blow off at 250 lbs. per square inch, has fittings to which are coupled

the indicators and gauges to be tested. The pressure generated in the boiler, and acting on the indicators and gauges, is also admitted against a mercury column of the height of 42 ft., extending from basement to roof of the building. In the testing-room proper is a dial 7 ft. high, which shows to a scale of 2 in. to the foot the whole range of the mercury rise in the 42 ft. column. Messrs. McInnes & Cairns are now in a position to test any instruments that may be sent to them under this absolutely correct method, as well as supplying their own make of new instruments tested in this way.

The Clyde shipbuilding yards and engineering works have long formed a great practical school from which the world has drafted men to whom has been assigned the control of new undertakings in marine construction. Clyde-trained men are to be found everywhere, and generally in positions of high responsibility. The impetus given to shipbuilding enterprise by the "naval programme" of several of the Continental Governments lately has resulted, as is well known, in the establishment by British firms of new works on the Continent. This has naturally been followed by a demand upon the personnel of existing establishments in this country, and the number of Clyde men lately drafted to foreign lands has been considerable. Of individual firms who have had to contribute to this migration, perhaps Messrs. Thomson, of Clydebank, have had most call upon them. Mr. John P. Wilson, who was previously manager at Clydebank, is now shipbuilding manager at the new dockyard at Bilbao, established by Sir Charles M. Palmer, of Newcastle; and quite recently, formal leave was taken of Mr. James McKechnie, who has been second in command in Messrs. Thomson's engine works, and who assumes control of the engineering department of the new Bilbao establishment. Mr. McKechnie and other two or three skilful men who go with him, have been closely associated with the designing and constructing of the machinery of the high-speed vessels which have lately brought such credit to the Clydebank firm. Mr. McKechnie is at present arranging for machinery for the new works, which are at once to be utilized in constructing high-speed engines for three Spanish cruisers under construction in the dockyard. With the services of men of such skill and experience the success of the Bilbao enterprise may safely be predicted.

Great interest is being taken in Glasgow in the project of a ship-canal between the rivers Forth and Clyde, and an agitation is arising with reference to conserving the interests of the "second city of the Empire," in the event of the project being proceeded with. From all that has transpired regarding the scheme as presently framed, the tendency would be to promote the interests of the Forth Valley at the expense of that of Strath Clyde, and this fact is naturally very disquieting to local minds. A correspondence is proceeding in the daily Press on the subject, and on the 21st October an address was given on the subject of ship-railways before the Glasgow Chamber of Commerce by Mr. William Smith, C.E., harbour-engineer at Aberdeen.

The James Watt and other docks at Greenock have been almost constantly occupied to their full extent for some time; but should the above project of having a canal between the Forth and Clyde be carried through, the star of Greenock as a shipping *entrepôt* will still further be in the ascendant. The western terminus of the canal would in all probability be about Dumbarton, only a few miles above Greenock.

The thirty-third session of the Institution of Engineers and Shipbuilders in Scotland was opened on the evening of Tuesday, 22nd October, when Mr. Ebenezer Kemp, of Messrs. Alexander Stephen & Sons, Linthouse, assumed the Presidency, and gave an interesting address. A pleasing function also fell to be discharged by him in the presentation of the Institution's medals and premiums for papers read by members during the session 1887-88. To Mr. Nisbet Sinclair, one of the experts in Messrs. Robert Napier & Son's, he presented the Marine Engineering Medal for his valuable paper on "Experiment on the Strength of Copper Steam Pipes made at Lancefield Engine Works" (Messrs. Napier's). To Mr. Robert Simpson, C.E., B.Sc., he presented the Railway Engineering Medal for his paper on "The Construction of the Glasgow City and District Railway," and to Mr. Geo. C. Thomson, F.C.S., he presented a premium of books for his paper on "Copper and Copper Castings."

## TRADE NOTES FROM THE TYNE, WEAR, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—During the past few weeks a considerable number of new steamers have come into the market, and but little difficulty appears to have been found in disposing of them at remunerative prices. It must not be inferred that these vessels were thrown upon the builders' hands through any breaches of contract on the part of customers, the fact of their being available for market purposes being due to an entirely different cause—namely, a practice which is being adopted by some builders of putting down "on spec" vessels of a particular type that are adapted to the wants of certain trades, and are consequently pretty sure to find purchasers when finished, so long as freights hold good. A fair number of old vessels have also changed hands lately, and on the whole the brokers may be said to have had a tolerably busy time. The enquiries for new tonnage that are now being received by builders are comparatively few in number, and as the builders have been compelled to advance their prices proportionately with the increased prices of material, it is evident that the difficulty of securing new contracts will be greatly enhanced. Fortunately at this moment there is no cause to repine over the falling off of enquiries, as there is plenty of work in the yards; but with the superior productive facilities that have been introduced in recent years, this plentifulness must soon disappear, unless the tide of fresh enquiries again begins to flow. It is to be regretted that the workmen have just at this juncture—when things have begun to look somewhat indicative of the advent of a slack period—thought fit to put forward a demand for an advance of wages, a course of action which cannot fail to have at least a temporarily damaging effect upon the interests of the trade. The application for an advance was originally made on behalf of the men connected with the Boilermakers' and Iron Shipbuilders' Society on the Tyne and at the Hartlepoons, but, owing to the disinclination of the shipbuilders in those districts to entertain the application apart from their colleagues on the Tyne and Wear, with whom they have lately amalgamated, the scope of the demand has now been widened so as to include the operatives in the whole of the districts named. The amount of the advance claimed is 10 per cent. on piece prices, and as the men received in February an advance of 5 per cent., and in July a second advance of equal amount, they will, if the present demand is complied with, have 20 per cent. higher wages than they had at the opening of the year. It is a most inconvenient and inopportune time for any section of men to put forward wages demands, as towards the close of a year there is usually an element of uncertainty in the prospects of almost all businesses; and seeing that the shipbuilding operatives have already received two advances during the present year, it would have been but reasonable on their part to have withheld further claims till the early months of next year, when all parties will be in a better position to forecast the probabilities of the future. In this connection it may be stated that an important movement has just been inaugurated which has for its purpose the fusion into one great whole of all the existing associations of shipbuilding employers in the country, so as to enable them to cope more effectually with the power of the trade unions in their respective districts. A representative meeting of employers from the various shipbuilding centres has been held at Carlisle in connection with this project, and there is little reason to doubt that it will, before the expiration of the year, become an accomplished fact. The second batch of orders of the new Admiralty programme has, it is stated, now been distributed among private builders, and it is understood that two of the leading Tyneside firms, namely Messrs. Armstrong, Mitchell & Co., and the Palmer's Shipbuilding and Iron Co., Limited, have been the recipients of a good proportion of the same. Particulars have not yet transpired, but it will probably be found that these two great firms have received orders for at least four large vessels between them, in addition to the five second-class cruisers they had already been commissioned to build. Messrs. Armstrong, Mitchell & Co. have their two largest berths at the Elswick yard unoccupied, and there is little reason to doubt that they have been reserved for the orders which have now come to hand. The same firm have just launched from their Low Walker yard a splendid passenger steamer named the *Germanic*, which has been built to the order of the Hamburg and American Steam Navigation Co. The vessel is 326 ft.

long by 40 ft. beam, and is fitted up to accommodate a large number of first-class passengers and emigrants. There are still on the stocks of the Low Walker yard several large steamers of different types, and others are ready to be put down as soon as berths are open. The Palmer's Shipbuilding Co. have also a great amount of work of the mercantile class, to supplement the extensive Admiralty orders now in their possession, and whatever the fortunes of other firms may be, there is no doubt that in their case a couple of years of brisk business is assured. Messrs. Hawthorn, Leslie & Co. are fitting out, in the vicinity of their yard, the large Russian twin-engined steamer, launched by them towards the close of last month, and they are preparing to lay down two other high-class steamers that have been ordered by Russian owners. The sister ship to the *Destera*, a twin-screw passenger vessel which was built to the order of the National Steam Navigation Co., Rio de Janeiro, was launched early this month, and the firm are now busily engaged in giving the finishing touches to both these vessels. Messrs. Swan & Hunter have their berths quite full, and will figure prominently in the output returns this year. The firm is among the few in the Northern district who have determined to give a trial to the new pneumatic caulking tool, which is being introduced by Messrs. Crossley Brothers, Manchester, and which, if found to be suitable for shipyard work, is pretty certain to almost entirely supersede hand-caulking. Messrs. W. Richardson & Co., who for some time past have devoted themselves almost exclusively to first-class work, have now one or two berths vacant, but it is understood that keels will be placed in them shortly. The Tyne Shipbuilding Co. are energetically pushing forward the construction of the vessels on their stocks, all of which are of large tonnage. Messrs. W. Dobson & Co., Messrs. Wood & Skinner, Messrs. R. Stephenson & Co., Messrs. Schlesinger, Davis & Co., Messrs. Readhead, and the Edwards Shipbuilding Co., Limited, are all as busy as possible, and at the different repairing establishments considerable activity is to be noticed.

**Engineering.**—Messrs. Hawthorn, Leslie & Co. have recently engaged a cruiser built at the Elswick shipyard, besides several first-class passenger vessels turned out from their own shipbuilding department at Hebburn. The Palmer's Shipbuilding & Iron Co. are quite overburdened with work in their engineering department, and several vessels of their own building are now awaiting turns at the shearlegs to receive their machinery. The Wallsend Slipway & Engineering Co. are just now engaged in engineering the Hamburg passenger steamer recently launched from the Low Walker yard of Messrs. Armstrong, Mitchell & Co., and have yet to supply several other first-class vessels, as well as a number of ordinary cargo boats, with their engines and boilers. The North Eastern Engineering Co. have also a great quantity of work in hand at their Wallsend establishment, and the whole of the other marine engineering works continue to show a high state of activity. At the works of Messrs. Clark, Chapman & Co., Gateshead, extraordinary activity exists, and the weekly output of steam winches, patent capstan windlasses, &c., is almost unprecedentedly large. The great resources of the firm enable them to continue booking orders when most other firms in the same lines of business have to refuse all orders excepting such as are not accompanied by stipulations for delivery by specified dates, and in this they have a very obvious advantage over their competitors. Messrs. Carrick & Wardale continue to have plenty of enquiries for their patent ships' pumps, and are extremely busy, not only in this, but in other departments of their works. Among the other exceptionally active engineering firms must be mentioned Messrs. Watson & Sons, High Bridge, whose pumps for use on shipboard continue to be in great request. Messrs. Allen & Robson, of 30, Dean Street, are now doing a very large and rapidly-extending business in the sale of the new speciality, "Magnolia Metal," which is giving complete satisfaction wherever it is adopted. To users of heavy machinery it is indeed invaluable, as by its use the journals are kept cool and in perfect order. Mr. Thomas Boyde, of 27, Bath Lane, has, since his start in business a few months ago, been very successful in securing orders for his steering and engine-room telegraphs from the leading engineering firms, and his establishment continues to be kept briskly going. Messrs. George Angus & Co. have received from the adjudicators at the Paris Exhibition a silver medal (the highest distinction given in this class) for their india-rubber goods. The demand for their celebrated speciality, "Amianthus Cloth Packing," for triple-expansion engines, is now very large, and is steadily increasing.

**Electric Lighting.**—Messrs. J. H. Holmes & Co., electrical engineers, &c., Portland Road, have, among other important contracts, the installations for several steamers, building and about to be built, by Messrs. Hawthorn, Leslie & Co. They have also some orders of special importance from the Midland Railway Co. Their works of extension, which will double their present productive capacity, will soon be completed.

Mr. Wasteneys Smith, Newcastle-on-Tyne, has received a number of additional orders for his patent stockless anchors, including the outfits for two war vessels building for a foreign Government. The bower anchors for these latter are to be stowed up hawse pipes, similar to the system now so largely adopted by the Mercantile Marine, as it prevents any exposure of men to fire while working the anchors, and this method will doubtless soon become general for modern war ships.

### THE WEAR.

**Shipbuilding.**—Several causes, differing greatly in their nature, have contributed to retard work in the Sunderland ship yards during the month of October. The first and most important factor in preventing contracts from progressing satisfactorily was the weather, which throughout the month has been variable, the tendency to wet, however, on most days predominating. The second most noticeable cause of stoppage was one which has often before been heard of, namely, the difficulty of getting adequate supplies of material, and the last, though, unfortunately, not the least of the obstructive influences, was the voluntary and culpable loss of working time by certain sections of the operatives. In spite of these hindrances, however, a fair amount of work has been done, though, of course, the results are small to what would have been achieved had the general conditions of work been more favourable. Mr. James Laing has ready for launching a large and handsomely designed steamer, which is to augment the fleet of one of our leading lines, and several other vessels of a superior class are either in course of construction or on order. Messrs. R. Thompson & Sons launched, on the 23rd inst., a fine vessel which has been built to the order of Liverpool owners; and they have in an early stage of progress another vessel which, it is understood, is ordered by the owners of the "Inch" Line. They are proceeding briskly with the construction of the "Cable" ship, which they were commissioned to build a short time ago; and at their graving dock they are executing extensive repairs to the steamer *Triumph*, which was sunk about a year ago at the mouth of the Tyne, and lay submerged for quite three-fourths of that period. It is understood that Messrs. J. L. Thompson & Sons are building a fast steamer for the tea trade; and they also have had some good repair contracts to deal with during the past few weeks. The Sunderland Shipbuilding Co. have ordered from Messrs. Hugh Smith & Co., Glasgow, a powerful hydraulic plate-bending machine for bending keel plates, flange plates, brackets, tops of floors, &c., while cold. The firm have been negotiating for the building of a steamer of greater tonnage than any that has yet been built on the river, but it is not at present known whether the matter has been definitely settled or otherwise. Messrs. Bartram & Haswell are busy on two large vessels, and a third will be shortly on the stocks. The Strand Shipbuilding Co., who for many years past have not had more than two vessels building simultaneously, have now a third keel on the stocks, and a busy winter is looked forward to by the employees. Messrs. Short Brothers are succeeding in getting through a large amount of work, and are enabled to put a vessel off the stocks each month. As the vessels are mostly of large tonnage, the output this year is likely to be above the average. Messrs. Doxford are rearranging the position of their building berths, with a view to secure greater launching room; and it is understood that one or two of the orders they have now on their books are for vessels of quite an exceptionally large class. At Messrs. Pickersgill's establishment the work of extension alluded to in last month's report goes briskly forward, and by the end of the year a very different aspect to that which it now wears will be imparted to the place.

**Engineering.**—The greatly increased business requirements of Mr. John Dickinson, of the Palmer's Hill Engine Works, have made it necessary to acquire all the quay accommodation that could be obtained; and accordingly a piece of ground which adjoins the factory on the west side, and forms a continuation of the existing quay, has been taken over, and will henceforward be utilized as a receptacle for machinery, boilers,

&c., while awaiting shipment. The firm have now some special contracts of importance in hand, and are carrying out extensive repairs to the engines of a steamer which is lying beside the quay. The demand for Dickinson's Patent Crank-Shaft continues good. The state of business at the North-Eastern Engineering Company's Works must be very gratifying to the directors and shareholders, as all the shops are in the fullest activity, and the execution of contracts is being pushed forward with energy. The resources of Messrs. Doxford's establishment are being fully utilised to meet current requirements; and at the Southwick Engine Works the briskness noted in previous reports is maintained. Messrs. John Lynn & Co., steam winch and steering gear manufacturers, are now receiving more enquiries than they are able to entertain, as they are booked up to the full capacity of their establishment for many months to come. This, and other firms in the same line find it inconvenient to be hampered with an excess of work, especially as they could get much better prices now for their products than when existing contracts were accepted. Messrs. Douglas, of the Bedford Street and Low Quay Engine Works, have commenced the manufacture of steam winches of a special type, and have received a good many orders from shipbuilders in the district. They claim for their winch that while the price is no more than is charged by other makers, it is stronger, and consequently more durable than most of those at present in use, and has the additional advantage of occupying less space. Messrs. Harrison & Co., of 9, Bridge Street, Sunderland, who are the agents for Laing's Improved Patent Piston Ring and Spring, are pushing the sale of that specialty with very marked success; and have not only succeeded in getting it adopted by some of the principal local engineering firms, but are also getting it brought into use by colliery owners, two having recently been ordered for the engines at some of the collieries belonging to Lord Londonderry. It is understood that the agents and patentees are now arranging for the acquisition of suitable premises in which to carry on the manufacture of the specialty on a scale commensurate with the large and steadily-increasing demand. It may be stated that Messrs. Harrison have also been very successful in introducing the Well's Light in the district; every shipbuilding and engineering establishment on the river having now, through their instrumentality, been supplied with this most effective aid to the carrying on of out-door work at night. The agents are now anticipating, within an early period, the pretty general adoption of the light among the colliery owners of the district. Forges, foundries, and rolling-mills continue to be well employed, and rivet works, anchor works, and chain works are kept in steady operation.

**The Hartlepoons.**—The two extensive shipbuilding yards of Messrs. W. Gray & Co. are crowded with work, a large proportion of the vessels on the stocks being ordered by local owners. In the graving dock department there is also a good deal of activity. Messrs. Withey & Co.'s establishment is also in full prosperity, the whole of the building berths being occupied with vessels in various stages of progress. The engineering works of Messrs. Thomas Richardson & Sons continue to show exceptional briskness, there being engines in course of construction not only for vessels that are being built at local yards, but also for vessels building at other centres on the North-East Coast. In the forging department the pressure of work continues very great. At the Central Marine Engine Works unabated briskness is still to be noticed, and a night shift in all departments is maintained. A large amount of work is now being turned out each week from the new forge, the facilities of which for quick and economical production are probably unsurpassed in the North. The steel works continue to be kept very briskly employed, and the Hartlepool Rope Works were never busier. Cement works are also in active operation, the local demand for the commodity being good. In the timber trade there is still much activity, the importations being heavy. As the season will close shortly, stocks are rapidly accumulating in the "bond yards," which for the time being wear an aspect of great animation. The saw mills are also kept busy, as there is a considerable amount of building work going on in the neighbourhood.

**Stockton.**—In the whole of the Stockton shipbuilding establishments activity continues to be noticeable, and during the month a number of important launches have taken place. Messrs. Blair & Co.'s marine engine works continue extremely busy, and since this time last month the following vessels that have had their engines and boilers supplied by the

firm have had their trial trips:—The s.s. *Aurora*, built by Messrs. Ropner & Son, of Stockton, for Messrs. Rickinson, Son & Co., of West Hartlepool, having engines of 190 H.P. nominal, with cylinders, 23 in. by 37½ in., and 16½ in. by 89 in. stroke. The s.s. *Parkgate*, built by Messrs. Turnbull & Son, Whitby, for Messrs. Turnbull, Scott & Co., of London, having engines of 175 H.P. nominal, with cylinders 22 in. by 36 in., and 69 in. by 39 in. stroke. The s.s. *Ackworth*, built by Messrs. Ropner & Son for Messrs. Merryweather & Co., of West Hartlepool, having engines of 160 H.P. nominal, with cylinders 21 in. by 35 in., and 57 in. by 39 in. stroke. The s.s. *Avonmore*, built by Messrs. J. L. Thompson & Sons, of Sunderland, for Messrs. Johnston & Co., of Liverpool, having engines of 220 H.P. nominal, with cylinders 23½ in. by 39 in., and 64 in. by 42 in. stroke. The engines for the whole of these vessels have been constructed to work at 160 lbs. pressure of steam, and on their trials gave complete satisfaction. The other engineering works, boiler works, &c., continue busy.

**Middlesbro'.**—The yards of Messrs. Raylton, Dixon & Co. keep fully employed, and in the frame bending departments night work is being resorted to. Messrs. Harkess & Sons have commenced the construction of a twin-screw steamer which has been ordered for a special trade. Messrs. Westgarth, English & Co., marine and general engineers, are abundantly supplied with orders, and are contemplating an extension of their works. In the steel and iron works, business is very active, and the greatly increased shipments of pig iron have caused much stir at the docks.

**Darlington.**—The leading industries at this centre continue prosperous, but the activity at the Darlington Forge Co.'s Works is especially noticeable. The company continue to book important orders, and almost daily are being sent out finished forgings of the heavier kind to various shipbuilding and engineering firms in the Northern district.

## NORTH-WEST OF ENGLAND.

**Barrow.**—The shipbuilding trade of the North-West of England has assumed a still more active position during the month, not only by reason of the new orders which have been booked, but by the desire which exists on the part of builders to clear their yards of present contracts, in order to make room for what promises to be a succession of good orders for first-class steamers. The demand for the latter is certainly most marked, and builders have already tendered, and are now engaged in preparing other tenders for important ocean steamers of the highest class. The order booked three weeks ago by the Naval Construction and Armaments Co., for the building of three passenger and mail steamers for the Canadian Pacific Railway Co., is the most important contract hitherto placed in Barrow, and to a great extent it fills the hands of the builders at a time when they were ready for new work, in order to supplement the orders previously received from the Admiralty for three second-class cruisers. It is understood that none of the first-class cruisers for the Admiralty will be built at Barrow, but strong hopes are entertained that at least one of the first-class battle-ships required by the Admiralty will be placed at Barrow. The Naval Construction and Armaments Co. is one of the seven firms which have been asked to tender for these battle-ships, but the tenders are not to be sent in until next month. The three Canadian Pacific Railway Co.'s steamers, ordered at Barrow, are to be twin-screws, with longitudinal bulkheads, similar to the *City of Paris* and the *City of New York*, and they are each to be fitted with two sets of triple-expansion engines, capable of driving the steamers at the rate of 18 knots per hour. Their measurements will be 450 ft. length; 51 ft. breadth; and 36 ft. depth, moulded. They are to be delivered within 18 months, and will then be placed on the Pacific station between Vancouver, in British Columbia and Yokohama and Hong Kong. It is understood the contract price approximates £600,000 for the three steamers. In addition to this work the Naval Construction and Armaments Co. have in hand two steamers of 3,000 tons for Messrs. Elder, Dempster & Co., of Liverpool, and are engaged in completing three steamers already launched, one the *Arequipa*, of 4,000 tons, for the Pacific Steam Navigation Co.; the *Matida*, of 3,000 tons, for the British and African Co., and intended for the Congo trade, and a smaller steamer, the *Ida*, for Messrs. Lamport & Holt. During the month the Naval Construction and Armaments Co. have had wages difficulties with two classes of their workmen,

the drillers and the angle-iron smiths' helpers, but in both cases the strikes have been settled on amicable terms. The greatest activity is experienced in the engineering and boiler making departments, and a full set of men are engaged in both these branches, while the urgency of some of the orders render overtime a necessity. It is noteworthy that with the growth of activity in shipbuilding at Barrow there has been a similar development in the steel shipbuilding material department at the Barrow Steel Works, where not only are plates, angles, channels and other sections rolled, but steel castings for sterns, rudder posts, stern posts, and other heavy work are now made. This is a new departure at Barrow, but one which promises to be an important addition to the shipbuilding facilities already possessed at this place. The works of Messrs. Westray, Copeland & Co., Barrow, which are in the hands of trustees in bankruptcy are about to be taken over by a new company, with Mr. G. J. Copeland, as manager. The works are admirably adapted for the engineering and boiler making trades, and are well laid out for a large work in ship repairing, &c. Under the old regime several high class full-power marine engines were built here. It is believed the new company will be highly successful, as there is plenty of local and general trade offering, and, if at some early date the graving-dock shipyard at Barrow is resuscitated, these works will be found admirably situated for the engineering work required for the vessels built at this yard. It is feared that the recent advance in the price of plates, angles, &c., will check orders for new steamers which were pending.

**Whitehaven.**—Some time ago, it will be remembered, that on the occasion of a launch at Whitehaven, the ways parted, and the vessel remained half-way off the stocks; but was ultimately successfully launched. In the early part of October a similar accident happened in the launching of the four-masted steel ship *Englehorn*, but after a few days the launch was successfully completed without much injury being done to the vessel. This vessel was built for Messrs. R. De Wolf & Sons, and is 819 ft. long, 42½ ft. broad, and 24 ft. 4 in. depth of hold, her register being about 2,400 tons. It is strange, however, that a similar accident should occur twice together. It is all the more unfortunate at a time when efforts are being made to revive shipbuilding at Whitehaven, by the raising of new capital.

**Maryport.**—A strike of shipwrights has occurred here. They ask for 3s. extra per week, but some have returned at 2s. per week. The trade at Maryport in shipbuilding is not brisk, but there are more hopeful indications.

**Workington.**—At Messrs. Williamson's yard there is more activity than for some years past, and good orders are expected from the negotiations now taking place.

## THE MERSEY.

ON both sides of the river, at Liverpool and at Birkenhead, the various shipbuilding yards are all well supplied with work, and the general outlook for the shipbuilding trade continues very satisfactory. There are plenty of enquiries stirring both for steamers and sailing ships, and although some of these may possibly be only put forward for the present as feelers, there is without doubt a large quantity of work ready to be placed out. Shipbuilders are, however, placed in a somewhat difficult position, not only by the largely increased price of all descriptions of materials, which taking it all through has within a very short period advanced from 25 to 30 per cent., but they are unable to get prompt deliveries of material already bought, and in this respect their position seems scarcely likely to undergo any improvement for some time to come, iron and steel manufacturers being with few exceptions heavily sold for the whole of their output for a considerable time ahead.

Another very serious matter is the wages question; already there has been an improved movement of 20 to 22 per cent., and there is evidently a very restless feeling amongst the men which may lead to further demands before very long. There is no openly announced agitation at present for a further general upward movement in wages, but the overtime question is being pushed to the front with the view of what is termed levelling up this extra allowance to the highest possible scale, and considering the general pressure of work, this is practically, only in another shape, a forcing on of higher rates of wages. Under these circumstances shipbuilders are necessarily compelled to be very cautious about entering into further contracts, and there is a disposition to work on practically from hand to mouth—that is, not to undertake contracts for ships beyond what

builders can actually lay down in their yards or commence within an early period. Some of the reports received through the workmen's societies would seem to indicate that here and there a slight falling off in trade is noticed by the men, and that enquiries with regard to new vessels being given out are not believed to be quite so numerous; but the returns do not show that there is any lack of employment, and on the Mersey there is no slackening off in activity. When men have been thrown out of employment, it has been more because work has had to be suspended owing to want of material, than that there is any want of orders on which to keep them fully going, and the number of men actually unemployed is extremely small.

On the Birkenhead side of the river, Messrs. Laird & Co. are very full of work. They are just completing a large screw steel steamer for the Hamburg American Co. This is a vessel about 3,700 tons, and about 3,500 I.H.P., and is being built for the general carrying trade. They are laying down another vessel of similar size, also constructed of steel throughout, for Liverpool owners, and this vessel is intended for the Atlantic cattle trade. They have also in hand several torpedo boats of exceptionally high speed for foreign Governments, and they are about laying down two war vessels for a foreign Government, whilst the Argentine ironclad *Almirante Brown* is in dock undergoing an extensive overhaul and refitting. The firm have also in hand a fine screw yacht of about 350 tons and 350 H.P., for Mr. S. R. Platt, of Oldham. With regard to reports which have recently been circulated that the firm, owing to the great pressure of other work, have had to decline orders from the British Government for new war vessels, we may add that this is scarcely correct, as Messrs. Laird sent in their tenders for some of this work, but no doubt being so well employed were in a position to hold out for better prices than other shipbuilding firms were willing to take, and this would seem to be the reason why Government work so far has not yet come into the hands of shipbuilders on the Mersey. There are, however, other Government contracts now coming forward, comprising first-class cruisers and battle-ships, and it is not improbable that some of them may be built on the Mersey.

On the Liverpool side, Messrs. W. H. Potter & Sons are also very busy, and they have work in hand to keep them fully engaged for a long time ahead. They have just completed a large iron sailing ship of 3,400 tons deadweight, and 2,200 registered tonnage, which has been built for the general carrying trade for foreign owners, and her first voyage is to Melbourne. The firm have also in hand an iron steamer of about 2,000 tons and 120 I.H.P.; a large iron sailing ship of 2,000 tons register and 3,700 deadweight, for the general trade, and amongst other work are a couple of barges for the Brazilian trade, each about 700 tons deadweight and 300 register. Messrs. Thomas Royden & Sons have in hand a couple of large steel steamers, one, which is being built for the firm, being about 3,000 registered tonnage, and the other, which is being built for Mr. Alfred Holt, about 300 ft. long, about 2,000 register tonnage, and intended for the China trade. Preparations are also being made to lay down another large steamer, and also a large sailing ship.

All branches of the engineering trade connected with shipbuilding are also very full of work, the firms in Liverpool district having large orders in hand not only for shipbuilders in the immediate neighbourhood, but also for outside districts. The same may be said of the engineering firms in the neighbourhood of Manchester engaged on various descriptions of machine tools for marine work, all of whom are not only fully occupied at present, but have orders in hand to keep them well engaged for some time to come.

The market for all descriptions of material used in shipbuilding continues to advance steadily, and makers are very chary about committing themselves to forward engagements of any weight. Both in manufactured steel and iron for shipbuilding purposes there has been a very considerable advance during the past fortnight, and with the continued upward movement in hematites and ordinary pig iron further advances before long are not at all unlikely.

In the timber trade prices continue firm, but there is no actual upward movement; the imports, although they have not been excessive, have been fully ample to meet requirements, and this has tended to keep prices stationary, whilst stocks are generally fairly moderate, but quite sufficient. Prospects for trade are, however, very good, and the tendency certainly in the direction of firmness.

With the close of the month the iron market has shown rather less animation, and there seems to be a belief that the

last advance, so far at least as some brands of pig iron are concerned, has been forced on rather by the operations of speculators than by really legitimate trade, and ordinary buyers have been less eager to place out further orders. It is not improbable that in speculative irons, in which there has been a temporary recession from the top prices that have recently been touched, there may be some considerable fluctuations, but the position of makers is not likely to be at all appreciably weakened as in most cases they are so heavily sold that a temporary cessation of buying would probably be regarded rather as a relief than otherwise. So far as what may be looked upon as the really legitimate trade, the general position of the market continues healthy and sound, and it would perhaps be an advantage if for a time there were a disappearance of that excitement which has recently characterized the market, so that there might be an opportunity of ascertaining with some reliability what the real value of iron at present is. As regards finished iron the position in some respects would seem to be scarcely so strong as it has recently appeared to be; although makers are all very well sold for some time forward the full prices which have been quoted during the past week or so are not in all cases being very readily obtained, and in many cases there is no doubt that buyers with definite business to put before manufacturers would be able to place out their orders at something under the full list rates. With regard to manufactured steel for shipbuilding purposes, makers are all so very full of orders that they are quite indifferent about entering into further contracts at present, and with the close of the month there has been a further advance of 6s. per ton. For steel ship plates of Scotch manufacture quotations are now firm at £8 17s. 6d., delivered ex-steamers, Liverpool, and ship angles at £7 15s., whilst steel boiler plates are quoted at £9 17s. 6d. per ton delivered ex-steamers, Liverpool. The iron market also closes with renewed firmness, and a strong upward tendency in all descriptions of pig iron.

## WELSH NOTES.

BY the time these notes are published the public will have secured from actual experience an idea as to whether Milford has any chance of successfully competing with the Mersey in the Transatlantic trade. The Barnum showmen are to land at the new place on the 24th October from the *City of Rome*. The G.W.R. will run a special fast train from Milford to town, and some people are sanguine enough to say that Liverpool will be licked. We do not want to say that we hope these prophets will be right, but at the same time we should like to see success crowning the efforts of the plucky Milford people.

Barry is certainly coming well to the front, and Penarth is feeling it more than the Bute Docks. The shipments at the new docks are much more than was expected, so that the shareholders should receive a very decent return upon the money they have invested. Of course this trade means a good trade also for the Barry Graving Dock Co., and the shareholders in it are simply glowing with satisfaction. But seeing they possess a monopoly, this is all one could expect.

The Welsh Colliery owners are ready to sell collieries, and any man with money, and a desire for posing as a coal master, can easily be satisfied. It is worth noting that all the collieries in the market are not worked out concerns. There are two or three very good ones for sale, and in some cases people buying now would secure the benefit of contracts for coals sold over 1890, which would mean a profit of close upon 20 per cent. upon a decent capital. The next boom should be in Welsh collieries.

Ship repairing at Cardiff is not brisk. At Newport they have been enjoying strikes in this particular trade, and at Swansea the dry dock owners are feeling fairly happy, for their docks are full. Barry is damaging Cardiff and Newport in ship repairing, as it is damaging them in coal shipments.

Cardiff people have been overjoyed during the past month on account of Congresses. The preachers have been there with the Archbishop of Canterbury at their head, and the sailors with Messrs. Plimsoll and Broadhurst at their head. Our readers will have learned from the dailies how the latter "show" went off. Mr. Plimsoll was in great form. He talked twaddle quite in his old, old way; he slanged Cory's because they would not give any money towards the Congress expenses, and he promised all who wanted such things a pocket camera to take photos of overlaiden ships. This was because the camera

does not lie, and shipowners do—at least, so said Mr. Plim-soll. How much reliance can be placed upon this very much misguided man's statements, shipowners themselves know.

Tin plates at last are on the boom. Prices are rushing up, and now manufacturers "On 'Change" are something awful; there is no holding them. Evidently, they have little faith in Brother Jonathan's tall stories about tinplate making in the States.

Another small steamer, for the Buenos Ayres Harbour Works, has been launched at Mr. J. A. Walker's yard, at Sud-brooke. Her dimensions are 150 ft. by 26 ft. by 8 ft. 6 in., and she is engined by Fleming & Ferguson, of Paisley.

It is stated that the Great Western Railway are taking into serious consideration the advisability of reducing the tolls on coal to Swansea. It is much to be hoped that some tangible benefit may be secured.

We learn that some Swansea men are about sinking a pit within a mile of Swansea East Dock, and that they expect to find a very fine coal. Should their expectations be realized a rich harvest will be reaped for Swansea; but we very much fear that the promoters are too sanguine. The anticlinal line runs right through the "taking," and it will be found that, whilst all the seams are there, they are almost on an end, which, of course, means an enormous amount going in working charges. We hope this may not be so, but geology seldom, if ever lies.

The coal market is in a queer state. During the past month prices are down fully 1s. 6d. per ton. Why this should be so is a little bit of a mystery. It may be due to a temporary lull, or it may mean that the bottom is knocked out of the Welsh coal market. On 'Change in Cardiff, a few days since, we were told that there were some 250,000 tons of coal standing in waggons in the South Wales district, unsold. This certainly looks bad. The fact appears to be that Welsh Colliery owners have put up their prices too much. The North countrymen have been slaves, with the result that now buyers abroad are pinning hopes to the Tyne people. Welsh coal is only worth a certain amount over North Country, and when the limit is passed, the latter quality is taken in preference.

We just hear that some tinplate works are stopped for want of tinplate bars, which looks healthy for the tinplate trade.

Since writing our first paragraph about Milford, the *City of Rome* has arrived. We must say it appears to us very strange that the Dock Co. so far made a mistake as to have the steamer delayed about an hour and a half in shifting passengers and luggage from the liner to the tender. This caused a serious delay to the passengers. They should properly have arrived in London at midnight on Thursday, but through the unbusinesslike conduct of the Milford Dock Co. they did not reach London till past 8 a.m. on Friday, and at that hour London is asleep—or, at any rate, as much asleep as any hour during the twenty-four.

### BELFAST TRADE NOTES.

THE shipbuilding and engineering trade still continues very brisk here, which is certainly a pleasant outlook for the winter months.

Messrs. Harland & Wolff have the new steamers—*s.s. Majestic* and *s.s. Nawab*—in hand, and will have some more launches shortly.

On the arrival of the *s.s. Teutonic* at Liverpool, on 25th Sept., she was placed in the Langton Graving Dock, and new propeller blades fitted under the superintendence of Mr. Pirrie, and her last run, in which she arrived in New York almost four hours before the *City of New York*, has afforded the greatest gratification here, and much greater things are expected of her yet, it being the general opinion here that she will surpass anything at present afloat.

On the 5th October the new *s.s. Yorkshire*, built by Messrs. Harland & Wolff, to the order of Messrs. Bilby Bros. & Co., Liverpool, left here for that port.

On 17th October the *s.s. Amer*, built to the order of Messrs. Brocklebank, Liverpool, left for that port.

Messrs. Workman, Clark & Co. are also pretty busy, and will have some launches to chronicle shortly. They have in hand, we understand, a new steamer for Messrs. Smith & Sons City Line, Glasgow, also one for the County Line of Belfast, and during the month had the *s.s. Euripides* under repairs.

Messrs. Mollwaine & Maccoll, Limited, still continue pretty

busy, and have three vessels almost ready for launching, one of them a sailing vessel for Mr. Fisher Barrow, and a steamer for Mr. William Hinde, coal merchant, Belfast.

Messrs. Burns have contracted with the Fairfield Shipbuilding & Engineering Co. to construct another steel paddle-wheel steamer of great power and the highest speed for their daylight service between this port and Scotland, she to be ready for sea on 17th May, 1890. This service was carried on between Greenock and Belfast during the past season by the splendid steamer *Cobra*, and the new steamer will surpass her in speed. The great numbers who availed themselves of this route thoroughly justified Messrs. Burns in putting on the service the finest steamers they could get.

The new dock is being rapidly pushed on by the contractors.

The Harbour Commissioners have taken steps to provide ample means for coping with fire, should it occur about any of the quay sheds, by the fire-extinguishing apparatus about being erected by them. They have also, we understand, decided to divide the sheds by brick divisions, thus isolating, as much as possible, fire should such take place.

On 27th September the ship-joiners struck work in Messrs. Harland & Wolff's, Workman, Clark & Co., and Mollwaine & Maccoll, Limited, for an advance of ¼d. per hour. Their present rate of pay is 7d. per hour, and they claim that the advance will only bring them up to the wages paid elsewhere. Unfortunately there is yet no prospect of settlement, both parties remaining firm.

The County Steamship Co., Belfast, of which Mr. W. J. Woodside is manager, and Mr. James Waterson is superintendent engineer, have had a vessel launched by Messrs. Austin & Sons, Sunderland, for them, and the other, which Messrs. Workman, Clark & Co. have in hand, will be their third steamer. Though but a young company, everything promises very well for them.

### LEITH NOTES.

THE shipbuilding and engineering trades here have been a little slackier this month, but still continue busy as compared with the corresponding month last year. No new tonnage has been placed in the water, but a large quantity is nearing completion, and launches will be numerous next month. The Grangemouth Dockyard Co. launched on the 27th ultimo the *Gaderen*, a handsome steel screw steamer of 500 tons register, built to the highest class in Norwegian Veritas. The above firm are fortunate in having a large number of vessels still to lay down, while their yards at Grangemouth and Alloa are full.

Messrs. Hawthorns & Co. have received an order for a small pair of engines for a boat to be built by Messrs. Mackenzie & Co. for Messrs. Sir Donald Currie & Co., London, to be employed in connection with their Africa Mail Line.

The price of Scotch coals has gone up, and supplies are being drawn from the Tyne in preference to the Forth.

The full returns of the Burntisland Harbour trade for the financial year ending with September, show the amount of work done to be greatly in excess of the gross returns for the previous year. The total gross trade amounts to 764,858 tons, as against 594,445 tons, being an increase of 170,413 tons.

On the 12th inst. the large steamer *Grimel*, from Turkey for Leith, with rye, went on Inchkeith, and remained fast. Several pumps of the Gwynne type have arrived from South Shields, where the vessel is owned, and the work of clearing her has been placed in the hands of Mr. Armit, Dundee, whose skill in those matters is so well known.

The plans of the Electrical Exhibition to be held in Edinburgh next year are now out. Those of Mr. W. A. Carter, of the firm of Carter & Penman, architects, have been accepted, and the requisite minimum guarantee fund having been obtained the ground is being measured out for building. The site chosen is an admirable one in the district of Merchiston, one of the southern suburbs, and commands a charming view of the Pentland Hills. The railway arrangements will be very complete, as the North British Railway main and suburban lines pass through the grounds, as do also the Caledonian main and branch lines. The Union Canal passes alongside, and will be utilised for the running of electrical barges and launches from Port Hopetoun in Edinburgh. Mr. Seymour Wade has been appointed Foreign Commissioner, and has already negotiated with several foreign commissions respecting the transfer from Paris of their splendid pavilions.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES.—ENGLISH.

**Arabian Prince.**—On September 24th Messrs. Short Brothers launched from their shipbuilding yard a handsomely-modelled steel screw steamer, built to the order of the Prince Steam Shipping Co., Newcastle, of the following dimensions:—Length, 300 ft.; breadth, 39 ft.; and depth, moulded, 21 ft. 2 in. The vessel is constructed under special survey to the highest class for steel in Lloyd's Registry, and is built on the cellular double-bottom principle for water ballast all fore and aft, and web frames, dispensing with hold beams. There are four large hatchways, with a powerful steam winch at each end, and donkey boiler fitted on deck, steam steering gear amidships, Emerson, Walker & Co.'s patent direct steam windlass, and all the latest improvements. The vessel is also fitted with a handsome cutwater and figure-head, giving her a very graceful appearance. This is the eleventh boat built for the Prince Co. On leaving the ways the vessel was named *Arabian Prince*, the ceremony being performed by Mr. Lunn, of Newcastle. The engines, which are to be fitted by Messrs. Allan & Co., of Sunderland, are of 200 H.P., on the quadruple-expansion principle, having three steel boilers of 200 lbs. working pressure, with all the latest improvements in marine engineering.

**Eiffel Tower.**—On September 25th Messrs. W. Dobson & Co. launched from their shipbuilding yard at Low Walker a finely-modelled steel screw steamer, built to the order of Messrs. F. Stumore & Co., of London, for their Tower Line. The dimensions of the vessel are:—Length, 347 ft.; breadth, 40 ft. 3 in.; depth, 29 ft. 4½ in.; the capacity for measurement being 5,500 tons. She will be classed 100 A 1 at Lloyd's, and is fitted for a few passengers amidships. The machinery is constructed by the Wallsend Slipway & Engineering Co., and the vessel was taken to their works immediately after the launch, which was highly successful. The steamer was named the *Eiffel Tower* by Miss Dobson, of The Chesters.

**Asterope.**—On September 26th there was launched from the shipbuilding yard of Messrs. C. Hansen & Sons, at West Cowes, a schooner-yacht of 150 tons measurement, built to the order of Mr. J. H. Burton, of Southampton. The vessel has been built to Lloyd's highest class, her frames, keelson, &c., being of best steel, and her planking of elm and oak, while her inside fittings are to be polished oak, teak, and pitch pine. The yacht, which was named the *Asterope* by Mrs. Burton, wife of the owner, is 85 ft. long on load water line, 20 ft. beam, and 12 ft. deep.

**Aid.**—On September 26th there was launched at Messrs. Wm. Allsup & Sons shipbuilding yard, Preston, the new paddle steamer *Aid*. The christening ceremony was performed by Mrs. Wymer, of London, who broke the suspended bottle and named the vessel the *Aid*, as she gracefully ran down the ways. The launch was very successful, and was witnessed by a large number of spectators. The vessel is almost unique of her class, being double-ended, and to be fitted with double-compound oscillating engines, and designed for the harbour service at Ramsgate. A small party of guests afterwards had lunch together, those invited including Mrs. Wymer and Miss Lindsay, Mr. D. W. Allsup, Mr. F. L. Lindsay, and Mr. F. W. Wymer, the chief surveyor to the Board of Trade, Harbour Department.

**County.**—On September 26th there was launched from the shipbuilding yard of Palmer's Co., at Jarrow, a steel screw steamer of the following dimensions, viz.:—Length between perpendiculars, 275 ft.; breadth, moulded, 37 ft. 6 in.; depth, moulded, 21 ft. 8 in. The vessel will be rigged as a two-masted schooner, and is built to class 100 A 1 at Lloyd's. She is of the well-decked type, with the bridge extended to the foremast. The upper decks are of iron. The captain and officers' accommodation is provided in a sunk poop aft; the engineers' accommodation is at the aft end of the bridge, and the crew at the fore end. Water ballast is provided for in a double cellular bottom, extending all fore and aft. Clarke, Chapman & Co.'s direct steam windlass is fitted on the main deck forward, steam steering gear amidships, and Hastie's screw gear aft. The vessel will load about 3,100 tons deadweight on a moderate draught. On leaving the ways she was named the *County* by Mrs. Taylor Smith. The steamer has been built for the Durham Steamship Co., of Newcastle, and has been inspected during construction by Mr. W. J. Jobling.

**Eagle.**—On September 26th there was launched from the yard of Messrs. R. & W. Hawthorn, Leslie & Co., Limited, Hebburn, what her builders believe to be the largest vessel ever built on the Tyne. She has been built for a Russian company, and is intended to run from the Black Sea to the East, and act, too, as a cruiser and transport in time of war. Her length is 440 ft.; length, extreme, 452 ft.; and breadth of beam, 48 ft. She was named the *Eagle*, and will be rigged as a three-masted schooner, having pole masts, also cutwater and bowsprit. She is a spar-decked vessel, with large deck-house amidships, in which will be provided a music saloon, chart house, captain's house, &c. The saloon for first-class passengers is on the main deck, and on the same deck and lower deck accommodation will be provided for 1,500 emigrants or troops, the space between decks being specially high to secure good ventilation, which is carried out on the steam injector principle. In addition to the large number of boats carried, she will also have a steam launch built of steel. She is to be fitted with twin screw triple-expansion engines, also built by Messrs. Hawthorn, Leslie & Co., at their St. Peter's Works, of great power, intended to drive her at a speed of upwards of 18 knots per hour. The lines of the vessel are exceedingly fine, and give every indication of attaining a high rate of speed. She has been built entirely of Siemens-Martin steel, and has a cellular bottom throughout her whole length, divided into numerous water-tight compartments for additional safety. There are two distinct boiler rooms, which, with engines, are in separate watertight compartments, and the additional advantage of twin screws will enable her, in case she should lose the use of one set of engines through accident or damage in time of war, to still steam at a high rate of speed. She will be fitted with forced draught arrangements on the closed stoke-hole principle, to be used on emergencies or when additional power is required. The vessel will be lighted throughout by electricity.

**Tuskar.**—On Thursday, September 26th, Messrs. Richardson, Duck & Co. launched from their yard at South Stockton a steel screw steamer of the following dimensions:—Length over all, 307 ft. 4 in.; breadth, extreme, 40 ft.; depth in hold, 20 ft. 2 in. The vessel, which has been built to the order of Messrs. Farrar, Groves & Co., of London, has a half poop aft, with accommodation for captain, officers and passengers, a raised quarter-deck to after engine-room bulkhead, and an awning deck from after engine-room bulkhead to stem. The engines are berthed in a deck-house on quarter-deck, and the crew in 'tween decks alongside fore hatch. She is built to the highest class at Lloyd's, has a double bottom all fore and aft on the cellular principle, capable of containing about 560 tons of water ballast. She is fitted with an Emerson, Walker's patent steam windlass, has a large Cestus donkey boiler, five horizontal steam winches, and every modern improvement for the loading and discharging of cargo. The engines, by Messrs. Blair & Co., Limited, of Stockton, have cylinders 22½ in., 37 in., and 61 in. by 42 in. stroke. As the vessel was leaving the ways she was gracefully christened the *Tuskar* by Mrs. Frederick Lees, of Ferny Field, Oldham.

**Orion.**—On Friday afternoon, September 27th, Messrs. Raylton, Dixon & Co. launched from their Cleveland Dockyard a fine steel screw steamer, which has been built for the Star Line of steamers from Liverpool to Calcutta, managed by Messrs. Thomas and James Harrison of the former city, and is the eighth vessel Messrs. Dixon have built for this firm. This vessel is built on the spar-deck principle, and is of the following dimensions:—Length over all, 361 ft. 6 in.; breadth, 40 ft.; depth, moulded, 29 ft. 2 in.; with a deadweight capacity of 4,450 tons. Her engines, which will be fitted by Messrs. Blair & Co., Stockton, are of 250 N.H.P., with cylinders 24 in., 40 in., and 66 in. by 45 in. stroke. The construction of the vessel has been supervised by Mr. R. D. Barrett, superintendent, and the building of the machinery by Mr. C. W. Cadman, consulting engineer, for the owners, and she is fitted with Emerson, Walker & Thompson Bros. steam windlass. On leaving the ways the vessel was christened *Orion* by Miss Lilian Bell, daughter of the late John Bell, of Rushpool Hall, Saltburn and Mustapha Reis, Algiers.

**Araquipa.**—On September 27th the Naval Construction and Armaments Co., Limited, launched from their yard at Barrow the steamer *Araquipa*, built to the order of the Pacific Steam Navigation Co., and intended for the coasting trade of South America. The *Araquipa* is sister ship to the *Santiago*, built in this yard for the Pacific Co., and handed over to the owners last week. The vessel is 350 ft. long, 45 ft. beam, and 31 ft.

9 in. depth of hold, moulded to upper deck, and is built entirely of steel, on the double-bottom longitudinal principle, the whole of the steel having been manufactured by the Barrow Steel Co. The steamer has four complete decks, two of them being entirely of steel. The upper deck is devoted exclusively to first-class passengers, and the saloons and state rooms will be fitted up in the most luxurious manner, with all the comforts rendered necessary in the hot climates in which the steamer will trade. The engines are of the vertical triple-expansion type, having cylinders of 31 in., 49 in. and 78 in. respectively, with 60 in. stroke. The steam pressure is 160 lbs. to the square inch, the I.H.P. being 3,500, and the speed 14½ knots; and she is fitted with patent direct steam windlass by Emerson, Walker & Thompson Bros., Limited. This is the sixth large steamer launched at Barrow for the Pacific Co. The ceremony of naming the steamer was performed by Miss Graves, of Liverpool.

**Iona.**—On September 27th Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer, built to the order of Messrs. Herskind & Woods, of this port. This vessel will take Lloyd's highest class. Her dimensions are:—Length over all, 285 ft.; breadth, 37 ft. 2 in.; depth, 21 ft. 10 in., with a poop aft, a raised quarter-deck, a long bridge to the forehatch, and a topgallant fore-castle. The saloon and cabins are aft, the engineers' rooms amidship, and the crew's accommodation in the bridge forward. The hull is built on the web-frame system. Large hatchways are fitted, four steam winches, steam steering gear amidships, screw gear aft, patent donkey boiler and patent windlass, boats on beams overhead, two masts with fore and aft rig, and all modern working appliances will be fitted for general trading. The Central Marine Engine Works of the builders supply fine triple-expansion engines, having cylinders 21½ in., 34 in., and 57 in. diameter, with a 39 in. piston stroke, and two large steel boilers to work at 160 lbs. pressure per square inch, fitted with Fothergill's patent system of forced draught, which, judging by the past results of the application of this system, is expected to give great efficiency and economy. She was gracefully christened *Iona* by Miss Hilda M. Woods, of Hartlepool, daughter of one of the owners. Captain Peterson has superintended the building of the vessel, while the machinery has been constructed under the superintendence of Mr. J. R. Fothergill.

**Lady Salisbury.**—On September 28th this fine screw salvage tug was launched by Mr. Harker, Stockton-on-Tees. She is 75 ft. by 15 ft. by 8 ft. 6 in. The engines have cylinders 14 in. and 27 in. by 18 in. stroke. The vessel is fitted with two large centrifugal pumps by Drysdale & Co., Glasgow. She has been built to the order of Messrs. W. H. Tucker & Co., Bute Docks, Cardiff, for the Bristol Channel service.

**Princess Sophia.**—On September 28th there was launched from the Howdon yard of Messrs. Palmer's Shipbuilding & Iron Co. a steel screw steamer of the following dimensions:—Length, 290 ft.; breadth, 40 ft.; depth, moulded, 23 ft. 9 in. She is built to class 100 A 1 at Lloyd's, and is rigged as a two-masted schooner. She is designed to load 3,600 tons. On leaving the ways she was named *Princess Sophia* by Miss Oran, of Sunderland.

**Camiola.**—On September 28th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, South Shields, a steamer named the *Camiola*. The vessel has been built to the order of Messrs. Chapman & Miller, of Newcastle, and is of the following dimensions, viz.:—Length, 290 ft.; breadth, 39 ft.; depth of hold, 20 ft. She is of the improved well-deck type, and built to class 100 A 1 at Lloyd's under special survey. The triple-expansion engines have also been constructed by Messrs. John Readhead & Sons.

**Romola.**—On September 28th there was launched by Messrs. Ropner & Sons, a steel screw steamer, built to the order of Messrs. Herskind & Woods, of West Hartlepool. Her dimensions are as follows:—Length over all, 282 ft. 6 in.; breadth, 38 ft. 10 in.; depth, moulded, 21 ft. 11 in. She has been built to the highest class at Lloyd's, and is designed to carry 3,300 tons. Her outfit includes all the latest appliances for the rapid loading and discharging of cargo. She will have triple-expansion engines by Messrs. Blair & Co., Limited, of 900 I.H.P., with two large steel boilers working at 160 lbs., and be fitted with Emerson, Walker & Co.'s patent windlass. As she left the ways the name of *Romola* was given to her by Mrs. R. O. Backhouse, of Hereford.

**Ivy.**—On Saturday afternoon, September 28th, there was launched from No. 2 Dockyard of Messrs. Raylton, Dixon & Co.,

Middlesbro', a steel screw steamer, which has been built to the order of Mr. John Hunter, of Hartlepool and West Hartlepool. This vessel is of the following dimensions:—Length, 238 ft.; breadth, 32 ft.; depth, moulded, 16 ft. 2½ in.; with a dead-weight carrying capacity of 1,600 tons. She is a well-decked vessel, with long bridge extending beyond topgallant fore-castle, &c. Her engines will be fitted by Messrs. Westgarth, English & Co., Middlesbro', having cylinders 16½ in., 26 in., and 44 in., by 33 in. stroke, and she is fitted with Emerson, Walker & Co.'s patent steam windlass. On leaving the ways she was christened *Ivy* by Miss Fanny Hunter, daughter of the owner. This is the fourth steamer launched by Messrs. Dixon within the last three weeks, or a total carrying capacity of 12,800 tons.

**Rotherfield.**—On Saturday, September 28th, 1889, Messrs. Edward Withy & Co. launched from their shipbuilding works at Hartlepool a large steel screw steamer measuring over 330 ft. in length, constructed throughout of Siemens-Martin steel, and built to the highest class at Lloyd's. She has a long raised quarter-deck, short poop, long bridge-house, and a topgallant fore-castle. The holds are fitted with iron grain divisions; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after holds the vessel is built on the web-frame system, which gives a very strong type of ship, and dispenses with all hold beams, thereby enabling the vessel to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and aft for water ballast, and the after peak is also available for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey boilers, steam steering gear amidships, Fothergill's reducing valve, screw gear aft, direct steam windlass on fore-castle, patent stockless anchors hauling up into hawse pipes, and other modern appliances, are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the passengers, captain, and officers, is handsomely finished in polished hardwood, with neatly painted panels, executed in a very effective style by the decorative staff of ladies employed by the firm. The vessel will be rigged as a two-masted fore-and-aft schooner, with iron pole-masts, and all cargo appliances for the expeditious handling of cargo. The engines have been constructed by Messrs. S. Richardson & Sons, Hartlepool, and are of the triple-expansion type, with two double-ended boilers.

**Sullamut.**—On Saturday afternoon, September 28th, there was launched from the shipbuilding yard of Messrs. Schlesinger, Davis & Co., Wallsend-on-Tyne, a large steel screw steamer, built to the order of Hajee Abdulatif Ballardina and Hajee Jousub Purbhoy, of Bombay. The vessel is of the following dimensions:—Length over all, 383 ft.; length, between perpendiculars, 370 ft.; breadth, moulded, 42 ft. depth, moulded, 30 ft. 3 in.; with a deadweight capacity of about 5,700 tons. She is constructed on the cellular bottom principle throughout for water ballast, and has a poop, bridge over the engines and boilers, and topgallant fore-castle. She has steel upper and main decks, the height between the main and upper decks being 8 ft., so that she may be used for transport or emigrant services if required. She will be rigged as a three-masted schooner. Muir & Caldwell's steam steering gear will be fitted in the wheel-house amidships, and Hastie's screw gear on the poop aft. Messrs. Emerson, Walker & Thompson Bros. patent steam windlass will be fitted on the fore-castle. The vessel will also be fitted with four powerful steam winches, for the rapid loading and discharging of cargo. She will have accommodation for 16 first-class passengers under the poop and bridge. The captain will be berthed in a house on the bridge deck, the engineers and officers being berthed under the aft end of the bridge. The fore-castle is being fitted up in a substantial manner for the crew. The *Sullamut* classes 100 A1 at Lloyd's, and has been built under special survey. The vessel will be fitted by the Wallsend Shipway & Engineering Co., Limited, with engines of the triple-expansion description of 2,500 I.H.P., having cylinders 28 in., 46 in., and 75 in. diameter, and 64 in. length of stroke, driven by two steel boilers 13 ft. 6 in. diameter, and 18 ft. 3 in. in length, working at a pressure of 170 lbs. per square inch. The contract was arranged by Messrs. M. D. Shroff & Co., the London agents of the owners. During construction the hull and engines have been under the superintendence of Mr. James Casey, of London. The vessel, as she left the ways, was named the *Sullamut* by Mrs. Davies, wife of the builder.

**Angelus.**—On Saturday, October 5th, at mid-day, there was launched from the yard of Messrs. Wood, Skinner & Co., Bill Quay, a steel screw steamer, built to the order of Jacob Burnett, Esq., of Tynemouth. The principal dimensions are:—Length over all, 205 ft.; beam, 30 ft.; depth, moulded, 16 ft., with a deadweight carrying capacity of over 1,200 tons. She is constructed on the cellular bottom principle, and will be registered in the highest class at Lloyd's. The vessel is of the well-deck type, with the cabins in the bridge-house amidships. The upper decks are of iron, and water ballast is fitted in the cellular double bottom throughout the holds and peaks. Emerson Walker's patent windlass is fitted forward, Donkin & Nichol's steam steering gear amidships, and Hastie's screw gear aft. The engines have been built to Lloyd's requirements by the North-Eastern Marine Engineering Co., Limited, Wallsend. They are on the triple-expansion system, of 550 I.H.P., and are capable of propelling the vessel at a speed of nine knots loaded. As the vessel left the ways she was named the *Angelus*, the christening ceremony being performed by Miss Burnett, daughter of the owner. Captain Ord is to be the commander of the ship. Messrs. Wood, Skinner & Co. have a vessel of similar dimensions to lay down in the berth occupied by the *Angelus*.

**Fulwell.**—On October 7th there was launched from the North Sands shipbuilding yard of Messrs. Jos. L. Thompson & Sons a steel screw steamer, built to the order of Messrs. Tyzack & Branfoot, of Sunderland. The vessel is of 3,100 tons deadweight carrying capacity, and has been built on the web-frame system to class 100 A 1 at Lloyd's, having been under special survey during construction. The water ballast tanks extend the full length of the vessel, and are constructed on the cellular double-bottom principle, and the holds are sub-divided by six steel watertight bulkheads. The engines have been built by Mr. John Dickinson, of Palmer's Hill Engine Works, and are of the triple-expansion type, having two steel boilers, each having a working pressure of 160 lbs. to the square inch. The deck machinery consists of windlass, horizontal steam winches, and steam steering gear amidships, with screw gear aft, and patent stockless anchor. Messrs. Bell and Rockliff's patent rolled sections have been used for the bulwarks, &c., thus greatly simplifying the details of construction. The naming of the vessel *Fulwell* was performed by Mrs. S. Tyzack, of the Esplanade.

**Kara.**—On October 7th there was launched from the yard of Messrs. C. S. Swan & Hunter a steel screw steamer of the following dimensions:—Length over all, 300 ft.; breadth, 39 ft. 10 in.; depth, moulded, 22 ft. 3 in. The vessel, which will be classed 100 A 1 at Lloyd's and built under special survey, is of the improved well-deck type, with poop, long raised quarter-deck, long bridge-house extending forward of the foremast, and topgallant forecastle. Water ballast in a cellular double bottom all fore and aft and after peak, four steam winches, steam steering gear, direct steam windlass, stockless anchors, and all improvements of the most modern description. The engines are by Messrs. Blair & Co., Limited, of Stockton, of the triple-expansion type, capable of indicating about 1,200 H.P. This vessel has been built to the order of the Mercantile Steamship Co., Limited, London, for whom the builders have another vessel on the stocks. As the vessel left the ways she was named *Kara* by Miss Ella Glover, daughter of Mr. Terrot Glover, Sunderland, who is superintending the building of the steamer.

**Matadi.**—On October 8th the Naval Construction and Armaments Co., of Barrow, launched the steamer *Matadi* for the British and African Steam Navigation Co. The vessel is built of steel, and is 311-6 ft. by 39 ft. by 24-7 ft., and is fitted with Emerson, Walker & Co.'s combination windlass. She is a sister ship to the *Boma*, recently built for the same firm.

**Irisco.**—On October 8th there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, Willington-Quay-on-Tyne, a steel screw steamer, built to the order of E. C. Thin, Esq., of Liverpool. She is of the following dimensions:—Length, 300 ft.; breadth, 41 ft.; depth, 22 ft. 2 in. She will be fitted with triple-expansion engines, having cylinders 23 in., 38 in., and 61 in., by 42 in. stroke, by Messrs. the Wallsend Slipway & Engineering Co., Limited, Wallsend, and with all modern improvements for the rapid loading and discharging of cargo. On leaving the ways the vessel was named the *Irisco* by Mrs. Irwin, wife of Mr. T. F. Irwin, Inspecting Engineer of Liverpool.

**Benisaf.**—On October 9th this vessel was successfully launched from the yard of Messrs. Wm. Doxford & Sons, at Pallion. She has been built to the order of the English & American Shipping Co., Limited, of London, managed by C. T. Bowring & Co. The vessel is entirely of steel, and built

to Lloyd's 100 A 1 class. The principal dimensions are:—Length, between perpendiculars, 270 ft.; breadth, extreme, 37 ft.; depth, from ordinary floor to top of main deck beams, 18 ft. 6 in., with cellular bottom fore and aft. The engines are triple-expansion, by Messrs. W. Doxford & Sons, with all the latest improvements, the cylinders being 21 in., 33 in., 54 in. by 36 in. stroke, and they are supplied with high pressure steam from very large boilers. She has long raised quarter-deck, long bridge, extending forward, having well 30 ft., bridge-house and short full poop. She is fitted with Bow, McLachlan's patent steam steering gear and Hastie's screw gear aft. She also has 2-7 by 10 and 2-7 by 12 steam winches, by Messrs. Welford Brothers, of Pallion, with all the latest improvements for cargo purposes, and Emerson, Walker & Co.'s direct steam windlass. The cabins are beautifully got up in hardwood aft, and give most comfortable quarters for captain, the officers and engineers being in bridge-house abaft engine-room, while the crew and firemen are comfortably berthed in front of bridge-house.

**County Derry.**—On October 10th there was launched from the ship building yard of Messrs. S. P. Austin & Son, Sunderland, the *County Derry*, a handsomely-modelled screw steamer of about 1,900 tons gross register, constructed of Siemens-Martin mild steel, under special survey to class 100 A 1 at Lloyd's, designed to carry a large deadweight cargo on a very light draught for all trades where this is necessary. The machinery will be supplied by the North-Eastern Marine Engineering Co., Limited, Sunderland, of the triple-expansion type, to indicate about 800 H.P.

**Ida.**—On Thursday, October 10th, the s.s. *Ida*, built to the order of Messrs. Lamport & Holt, Liverpool, was launched from the yard of the Naval Construction and Armaments Co., Barrow, making the fourth launched at Barrow for the same firm. The *Ida* is 166 ft. long, 32 ft. breadth, moulded, and 11 ft. 10 in. depth of hold. She is classed 90 A at Lloyd's, and will be fitted with triple-expansion engines 17 in., 26½ in., and 42 in. diameter of cylinders, by 24 in. stroke, and about 500 I.H.P.

**Helena.**—On October 10th another screw steamer, the *Helena*, was launched from the shipyard of Mr. T. A. Walker, of Sudbrook. The *Helena* is the seventh of a fleet of steamers now being constructed at this yard for working on the shallow waters of the River Plate, in connection with the Buenos Ayres Harbour Works. She is 150 ft. long, 26 ft. beam, and 8 ft. 6 in. draft. Her engines (by Fleming & Ferguson, Paisley) are quadruple expansion, and, unlike ordinary engines of this type, are not tandem, but have all four cylinders in one group on the same level, thus rendering the cylinders and valves of easy access.

**Holyhead.**—On October 10th Messrs. R. and J. Evans & Co. launched from their building yard, Brunswick Dock, Liverpool, a new iron four-masted sailing ship of about 2,260 tons nett register, for Messrs. William Thomas & Co., of Liverpool. The vessel was named the *Holyhead* by Mrs. William Thomas, and was launched by Miss Jones (daughter of Alderman Jones, of Bootle). The *Holyhead* will shortly sail for Melbourne, under the command of Captain Thomas Williams, who has superintended the construction of the vessel.

**Rubinstein.**—On October 10th Messrs. Bartram, Haswell & Co. launched from their yard at the South Dock, Sunderland, a large screw steamer for Mr. Jenneson Taylor. The following are the principal dimensions:—Length, 300 ft.; breadth, 39 ft.; depth, 19 ft. 6 in.; gross tonnage, 2,500 tons. She has been built under special survey for Lloyd's highest class, and is of the raised quarter-deck type. The engines will be supplied by Mr. John Dickinson, the cylinders being 22 in., 36½ in., and 60 in., with 42 in. stroke. The boilers are of steel, made to work at 160 lbs. pressure. The vessel was named the *Rubinstein* by Mrs. T. Metcalf, of Roker.

**Romulus.**—On October 10th Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length, 310 ft.; breadth, 41 ft. 6 in.; depth, 23 ft. 0½ in., built to the order of C. Anderson, Esq., of Hamburg, and to class 100 A 1 at Lloyd's. The vessel is of the well-decked type, with poop, containing saloon and cabins for officers and a few passengers, having the entrance through a house which forms a smoking-room. A long-raised quarter-deck, joining a long bridge, which is of extra strength, and carried right up to the fore hatch, and contains crews' quarters at fore-end and engineers' berths aft, open topgallant forecastle under Emerson, Walker & Co.'s direct steam windlass. The hull is built on the web-frame principle, dispensing with hold beams, and giving a clear hold for stowing bulky

cargo. Large hatchways are fitted, four steam winches, steam steering gear amidships, screw gear aft, two donkey boilers, and cellular double bottom throughout for water ballast. The rig will be schooner, with double fore topsails and topgallant sail. The boats will be carried overhead on beams, and a full equipment of modern appliances provided for general trading. The Central Marine Engine Works of Messrs. W. Gray & Co., Limited, supply the engines, which are of the triple-expansion type of 1,200 H.P., and two large steel boilers to work at 160 lbs. pressure per square inch. The hull and machinery are being inspected by Captain Berndt and Mr. Kreuzfeld respectively, on behalf of the owners. The christening ceremony was gracefully performed by Miss Assmann, of West Hartlepool, the vessel being named the *Romulus*.

**Westbrook.**—On October 11th Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—270 ft. length overall; 36 ft. 6 in. breadth of beam; and 19 ft. 5 in. depth; built to the order of Messrs. John Foster & Co., of Whitby. The vessel, which will take Lloyd's highest class, is of the well-decked type, with a poop containing saloon and cabins, long raised quarter-deck, and long bridge, which is carried right up to the fore hatch, having the engineers' berths at the aft end, while the crew are berthed in the fore part. The usual topgallant forecastle is fitted with Emerson, Walker & Co.'s patent windlass. The hull is built on the web-frame principle. Large hatchways are fitted, four steam winches, hand and steam steering gear amidships and screw gear aft, donkey boiler, double bottom under each hold for water ballast, pole masts with fore and aft rig, boats on beams overhead, and everything complete will be provided for general trading. Fine triple-expansion engines of 750 H.P., and two steel boilers to work at 150 lbs. pressure per square inch, are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. She was gracefully christened *Westbrook* by Mrs. John Foster, wife of the managing owner. The hull and machinery have been superintended during construction by Captain Richard Foster, on behalf of the owners.

—On October 12th Messrs. Osbourne, Graham & Co. launched from their yard at Hylton a steel screw steamer of the following dimensions:—Length, 290 ft. by 38 ft. by 22 ft. 6 in., moulded, depth. The vessel is built on the cellular system, and with web frames, short poop, raised quarter-deck, long-bridge to foremast and topgallant forecastle, and will be classed 100 A 1 at Lloyd's. Tri-compound engines will be supplied by Messrs. Black, Hawthorn & Co.

**Sicilia.**—On October 12th there was launched from the shipbuilding yard of Messrs. William Pickersgill & Sons, Southwick, a steel steamer of the following dimensions:—Length, 270 ft.; breadth, 37 ft.; depth, 19 ft. 8 in. She is built to the order of Messrs. Pierce, Becker & Ilardi, of Messina, to the highest classification of Lloyd's. The engines will be supplied by Messrs. George Clark & Co., of Southwick, with cylinders 21 in., 34 in., and 56 in., and 39 in. stroke, and large size boilers of 160 lbs. pressure. As she left the ways she was christened *Sicilia* by Mrs. F. Pickersgill.

**Andelana.**—On October 18th Messrs. R. Williams & Son launched from their shipbuilding yard at Workington the fine full-rigged sailing ship *Andelana*, built to the order of Messrs. E. T. & W. Roberts, of Liverpool. The *Andelana* is made entirely of steel, the plates being manufactured by the West Cumberland Iron & Steel Co., Workington. Her dimensions are:—Length, 320 ft.; breadth of beam, 42 ft.; and depth of hold, 24 ft. 6 in. Registered tonnage is 2,450 tons, and carrying capacity 3,800 tons, and is of highest class at Lloyd's 100 A 1. She will be fitted with all the latest improvements, and steam winches, &c., and has all her accommodation for captain, officers, and crew on deck.

**Pioneer.**—On Oct. 9th there was launched at the Milford Haven Shipbuilding and Engineering Works (Messrs. T. R. Oswald & Co., Limited) a steam trawler of the following dimensions:—Length, moulded, 118 ft. 6 in.; breadth, 20 ft. 6 in.; and depth of hold, 11 ft. 2 in. The vessel is built of iron to class 100 A at Lloyd's. She is ketch rigged, and fitted throughout with all accessories for trawling, fish carrying, and towing. The vessel was named the *Pioneer* by Miss Ethel Harper.

**Itaparica.**—On October 21st there was launched from the Low Walker shipbuilding yard of Sir W. G. Armstrong, Mitchell & Co. a steel screw passenger steamer, built to the order of the Hamburg South American Steam Navigation Co., Hamburg. On leaving the ways the vessel was named the *Itaparica* by Miss Ellis. The *Itaparica* is 326 ft. long, beam

40 ft., and depth, moulded, 25 ft., and is built to the highest class at Veritas. She has long full poop fitted for passengers; the whole available space in the fore 'tween decks is fitted up for emigrants, and she has also topgallant forecastle, and long bridge amidships, under which are provided the officers' and engineers' quarters. Immediately after the launch the vessel was taken to the works of the Wallsend Slipway and Engineering Co., where she will be fitted with triple-expansion engines.

**Kriemhild.**—On Thursday, October 24th, there was launched from the shipbuilding yard of Messrs. C. S. Swan & Hunter a handsomely modelled steel screw steamer—Length, 335 ft. over all; breadth, 39 ft.; depth, moulded, 25 ft. 9 in.; built under Lloyd's special survey to class 100 A 1 on the three-deck rule. This steamer has a long, full poop, handsomely fitted up with commodious cabins for first-class passengers, including large saloon, ladies' boudoir, smoke-room in marble, bath-rooms and lavatories with tiled floors, large entrance, cabin on poop deck, long bridge-house amidships, under which will be placed the engines, offices, doctor, large mess room, galley, &c.; full topgallant forecastle, under which will be the crew's quarters; water ballast in a cellular double bottom all fore and aft; steam winches for the rapid loading and discharging of cargo; steam steering gear, direct steam windlass, and all appliances of the latest description. The engines are by the Wallsend Slipway & Engineering Co., Limited, of the triple-expansion type, and capable of indicating 2,000 H.P. This is the second vessel built by the same firm for the Deutsche Dampfschiffs Rhederei, zu Hamburg, under the joint superintendence of Captain Schultz and Mr. Henert. As the vessel left the ways she was named the *Kriemhild* by Mrs. Henert.

**Palentine.**—On Thursday afternoon, October 24th, there was successfully launched by Messrs. Robert Thompson & Sons, from their Southwick Yard, Sunderland, a steel screw steamer, built to the order of M. M. de Arrotegui, of Bermeo, Spain. The following are the particulars of the vessel:—Length, 294 ft.; breadth, 39 ft.; depth, 21 ft. 11 in. She has raised quarter-deck from stern to engine-room bulk-head, long bridge extended to forecastle, water ballast in cellular bottom and peaks, hood covering stern, and accommodation for captain and officers in large deck-house aft. Accommodation for engineers is provided in house on deck immediately aft of engine-room, and for crew and firemen in large forecastle. She has large hatchways, four steam winches, donkey boiler, patent freeing ports, direct steam windlass, steam steering gear, lighthouses forward of rigging, and all latest improvements, and is schooner rig. The engines, by Messrs. T. Richardson & Sons, Hartlepool, are tri-compound, having cylinders 25 in., 40 in., and 68 in., with 42 in. stroke, with two large double-ended boilers. On leaving the ways she was named the *Palentine* by Miss Peliard, of Cleadon, Sunderland.

**Rauenthaler.**—On October 24th there was launched from the yard of the Sunderland Shipbuilding Co., Limited, the seventh steamer built by that firm for the Hansa Steamship Co., of Bremen. The length of the vessel is 323 ft., breadth 41 ft., and depth of hold 27 ft. 6 in. The steamer is built to the spar deck rule, and has large topgallant forecastle to accommodate crew and firemen, and long bridge amidships, under which is placed the saloon and accommodation for captain, officers, and a few first-class passengers. The vessel is constructed upon the web-frame principle, thus dispensing with hold beams, and has cellular water ballast all fore and aft; all weather decks are of wood, and all frames of Z steel. Her class will be 100 A 1 Lloyd's special survey, and also the highest class in the German Registry. The deck machinery consists of five large steam winches, Harrison's steam steering gear, which is placed in the engine room and worked from the bridge; Harfield's patent direct steam windlass, Tyzack's patent anchors, and all the usual appliances for handling cargo and working the ship with the greatest possible dispatch. The main engines are upon the tri-compound principle by the North Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 23½ in., 39 in., and 64 in., by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel during construction has been inspected on behalf of the owners by Mr. Wulff and Mr. Himer, and upon leaving the ways was gracefully named *Rauenthaler* by Mrs. Himer, after which she was towed into the South Dock to receive her machinery.

**Christensen.**—On October 25th there was launched from the Iron and Steel Shipbuilding yard of Messrs. Schlesinger, Davis & Co., Wallsend-on-Tyne, a steel screw steamer, built to the order of the firm of H. C. Christensen, of Marstal, through

Messrs. Pile & Co., of London and Newcastle. Her principal dimensions are as follows:—Length, between perpendiculars, 133 ft.; breadth, moulded, 22 ft. 3 in.; depth, moulded, 11 ft. 6 in. She has a long raised quarter-deck, short bridge, and topgallant forecastle. This vessel has been built to the highest class at Lloyd's and Bureau Veritas. Accommodation for the captain and officers has been provided under the raised quarter deck aft, and the forecastle is fitted up for the crew. The vessel will be rigged as a fore and aft schooner, and will be fitted with triple-expansion engines and steel boiler by Messrs. Hanna, Donald & Wilson, Abbey Works, Paisley. On leaving the ways the vessel was named the *H. C. Christensen*.

#### LAUNCHES—SCOTCH.

**Strathlyon.**—On September 25th Messrs. Russell & Co. launched from their Greenock yard the steel screw steamer *Strathlyon*, 3,550 tons, sister ship to the *Strathendrick*, launched in April for Messrs. Burrell & Son, Glasgow. The engines will be supplied by Messrs. James Howden & Co., Glasgow. The steamer is fitted with Messrs. Muir & Caldwell's steam steering gear, Napier's windlass, and all the latest improvements for the rapid loading and discharge of cargo. Messrs. Russell will place the keel of another steamer, for the same firm, on the vacated berth.

**Relampago.**—On September 25th Messrs. Davy & McKendrick, engineers and steam launch builders, Craigton Road, Govan, launched from the ferry slip at Renfrew, the *Relampago*, a steam tug of about 60 tons, built to the order of a Portuguese firm. The following are the dimensions:—Length, 65 ft.; breadth, 14 ft.; depth, 8 ft. She is classed at Lloyd's A 1 for towing purposes, and has been fitted with a pair of compound surface-condensing engines, with cylinders of 12 in. and 14 in. diameter by 18 in. stroke. Her boiler is of steel, and is suitable for a pressure of 100 lbs.

**Gaderen.**—On September 26th there was launched from the shipbuilding yard of the Grangemouth Dockyard Co., at Grangemouth, a handsomely modelled steel screw steamer of 500 tons, to the order of Captain Thomas Beck, on behalf of Messrs. Sonne & Watten, of Stavanger. She has been built to the highest class in Norwegian Veritas, and under the special survey of Mr. Lauritz Bodin, chief surveyor of that society in this country. The steamer, on leaving the ways, was named *Gaderen*. She has a long, full poop and topgallant forecastle, and is fitted up with all the latest improvements for working both ship and cargo. The engines, which are of the triple-expansion type, are being supplied by Messrs. Hutson & Corbett, engineers, Glasgow. Captain Larsen, of Stavanger, who has superintended the building on behalf of the owners, will take command when the ship is completed.

**Sommerfeld.**—On September 26th Messrs. Charles Connell & Co. launched from their yard, at Scotstoun-on-the-Clyde, a steel screw steamer of about 2,700 tons for the Hamburg-Australian Co. She is built to the highest class both in Lloyd's and Bureau Veritas, and is fitted up in first-class style for a limited number of passengers and emigrants. Messrs. David Rowan & Son supply the machinery, which is of the newest and most improved type. As she left the ways she was named *Sommerfeld* in the customary manner by Mrs. Uhde, wife of one of the company's superintending engineers.

**Sparrow.**—On September 26th Messrs. Scott & Co., shipbuilders and engineers, Greenock, launched from their dockyard, at Cartburn, Greenock, the first of two gunboats for the British Government. Both are composite vessels, with steel framings, and two thicknesses of teak planking. Length, between perpendiculars, 165 ft.; extreme breadth, 31 ft.; draught of water forward, 10 ft. 3 in., and aft, 13 ft.; freeboard, 4 ft. 3 in.; and tonnage, 805. The machinery will consist of triple-expansion engines of a horizontal type, capable of developing 1,200 H.P. The armament of the vessels consists of six 4-inch guns, two quick-firing guns, and four Nordenfeldts. Both vessels have been built from the design of Mr. W. H. White, Chief Constructor of the Navy, and have been superintended during their building by Mr. Allen, Admiralty overseer, Chatham Dockyard. The machinery has been constructed under the charge of Mr. J. A. Bedbrook, R.N. Engines and boilers have been fitted on board while the vessels were on the stocks, and the vessel launched on the 26th September was, with the exception of some minor fittings, quite completed. The vessel was named the *Sparrow* by Miss Bedbrook. The Rev. John Barclay, West Parish, conducted the usual service ordered by Government at the launching of vessels. These two gunboats are the last of a

series built for the Government during the past several years, the others having been constructed in Government dockyards.

**Canton.**—On September 26th Messrs. Caird & Co., shipbuilders, launched from their yard, at Greenock, a splendid steel screw steamer, named the *Canton*, built for the Peninsular and Oriental Steamship Co., for their India and China trade. She is a sister ship to the *Shanghai*, built by the same firm for the same owners a short time ago, and is a vessel of 3,000 tons gross. Her dimensions are:—Length, 350 ft.; breadth, 42 ft.; and depth, 29 ft. 9 in. She has a carrying capacity of 5,100 tons deadweight. Her builders will supply her with direct-acting triple-expansion engines of 2,200 H.P. She will be fitted out for sea at Greenock.

**Mozambique.**—On September 28th Messrs. Scott & Co., shipbuilders, launched from their yard, at Greenock, a large and handsomely modelled steel screw steamer of 3,400 tons register, for the Mala Real Portuguesa, of Lisbon. Her dimensions are:—Length, 350 ft.; breadth, 42 ft.; and depth, 28 ft. 6 in. Her engines, supplied by the builders, are 4,000 H.P. indicated. On leaving the ways the new steamer was named *Mozambique* by Miss Frances S. Scott, daughter of the builder. The *Mozambique*, which has accommodation for 75 first-class, 21 second-class, and 120 third-class passengers, and 240 soldiers, is sister ship to the *Rei de Portugal* and *Loanda*, lately built by the same firm for the Mala Real Portuguesa Co., and is the fourth of five steamers ordered from Messrs. Scott & Co. in the early part of this year.

**Mira.**—On September 28th Messrs. Aitken & Mansel launched from their shipbuilding yard, at Whiteinch, the *Mira*, a handsome screw steamer of 3,200 tons gross register, built to the order of Messrs. Thomas & James Harrison, Liverpool, and intended for the Star Line of Calcutta steamers. Her dimensions are:—Length, 350 ft.; breadth, 60 ft.; depth of hold, 28 ft. She is built of steel to Lloyd's highest class, and has been fitted out in the most complete manner. She will be fitted by Messrs. John & James Thomson, Finnieston Street, with triple-expansion engines of 1,600 I.H.P., with cylinders 24 in., 40 in., and 66 in. diameter by 54 in. stroke. The construction of the vessel has been supervised by Mr. R. D. Barrett, the company's superintendent.

**Aniline.**—On September 28th a screw steamer was launched from Messrs. J. & J. Hay's yard on the Forth and Clyde Canal, at Kirkintilloch. It has been specially built for conveying gas tar from the gasworks at Dawaholm to the chemical works of Messrs. James Ross & Co., Lime Wharf, Falkirk, and for that purpose it is fitted with three large iron tanks, which will contain 90 tons of tar. The speciality about the vessel is that the hull of the vessel forms two of the sides of the tanks.

**Humber.**—On September 28th Messrs. David J. Dunlop & Co., engineers and shipbuilders, Inch Works, Port-Glasgow, launched a handsomely modelled steel screw steamer, built to the order of Messrs. Wm. Sloan & Co., of Gordon Street, Glasgow, for their passenger and cargo service between Glasgow and Bristol. The principal dimensions are:—Length, 230 ft.; breadth, 32 ft.; depth in hold, 14 ft. 4 in.; and 900 tons gross. This vessel has been designed specially to suit the above service, and is considerably in excess of Lloyd's requirements, under whose special survey, and that of Mr. Neil, the company's surveyor, she has been built. A full poop is fitted, extending to main hatch and topgallant forecastle. Under the after end of the poop handsome and roomy accommodation is provided for the first-class passengers. Electric bells in communication with the pantry are fitted throughout the state-rooms and saloon accommodation. The vessel is also fitted throughout with electric light, supplied by Messrs. Harvie & Co., Glasgow. For the easy handling of the vessel she is fitted with Muir & Caldwell's patent steam steering gear. Napier's patent steam capstan windlass, and for the working of the cargo a steam crane and steam winches are also supplied by Messrs. Muir & Caldwell. The engines, which were made by the builders, are of the triple-expansion type, having cylinders of 21½ in., 34 in., and 57 in. diameter and 3 ft. 6 in. stroke, and are fitted with Morton's patent valve gear, and are expected to develop 1,200 I.H.P. Steam is supplied by two multitubular boilers fitted with Purves's patent furnaces, the working pressure of which is 165 lbs.

**Bavaria.**—On September 28th Messrs. Murdoch & Murray launched from their shipbuilding yard, at Port-Glasgow, a steel screw steamer named the *Bavaria*, of the following dimensions:—Length, 260 ft.; breadth, 37 ft.; depth 19 ft. 2 in., moulded; deadweight carrying capacity, 2,600 tons. This vessel has been built to the order of Messrs. David Scott & Son, Dundee, and is intended for the Baltic trade. She has been fitted up with the

most modern appliances for the rapid loading and discharging of cargo, has powerful steam winches, Alley & MacLellan's steam steering gear, and McOnie's steam windlass. She has water ballast throughout on the cellular principle, and is specially fitted for carrying grain in bulk, and is lighted throughout with electric light. The vessel has been built under the direct superintendence of Mr. John Witherspoon, marine surveyor, and is classed 100 A 1 at Lloyd's. After the launch the *Bavaria* was taken in tow for Glasgow, where the machinery will be put on board by Messrs. Dunsmuir & Jackson, of Govan.

**Francis Henty.**—On September 30th there was launched complete from the yard of Messrs. Simons & Co., Renfrew, the *Francis Henty*, a twin-screw dredging steamer of 700 tons, built to the order of the Agent-General for Victoria, and which is the seventh dredging vessel supplied by the builders to the same owners. It will dredge its way in shoals to 35 ft. depth of water, with steel buckets to raise 600 tons of spoil per hour. The engines will indicate 500 H.P. The *Francis Henty*, along with a sister vessel now building in the same yard, has all the most recent improvements, and was constructed under the direction of Mr. W. R. Kinipple, M.I.C.E., of London. The vacant berth will be immediately occupied by a large four-screw Hopper dredger for the Manchester Ship Canal Co.

**Torgorm.**—On October 5th, the Campbeltown Shipbuilding Co. launched from their yard, at Trench Point, Campbeltown, a handsomely-modelled steel screw steamer of 2,600 tons dead-weight, named the *Torgorm*, to the order of Messrs. Whimster & Watson, Glasgow, for their regular line from Glasgow to Demerara, Trinidad, and Barbadoes. This steamer has been built under Lloyd's special survey to class 100 A 1, has raised quarter-deck, long bridge-house extending forward of foremast, topgallant fore-castle, is fitted with Messrs. Alley & McLellan's steam steering gear amidships, Hastie's screw gear aft, Harfield's patent windlass, has cellular double bottom throughout, and all the latest improvements. Dimensions:—Length, between perpendiculars, 260 ft. by 37 ft. by 19 ft. 4 in., moulded, depth; engines, triple-expansion, having cylinders 19 in., 31 in., and 50 in., by 39 in stroke, by Messrs. Robert Harvey & Co., Glasgow.

**North Cape and North Pole.**—There was launched on Tuesday, the 8th October, from the building yard of Messrs. Hall, Russell & Co., Aberdeen, two finely-modelled steel screw steam trawlers, named *North Cape* and *North Pole*, of the following dimensions:—Length over all, 105 ft.; breadth, 20 ft.; and depth, 10 ft. 6 in.; and 120 tons gross register each. These vessels have been built under special survey to class 100 A at Lloyd's. They are fitted with compound surface condensing engines of 50 H.P. nominal, and one steel boiler with a working pressure of 100 lbs. per square inch, special steam trawling winches, windlasses, and all the most approved appliances for prosecuting the trawling industry. They are owned by Ex-Baillie Pyper and others, and their construction have been superintended by Mr. A. J. Tulloch.

**Gascony.**—On October 10th Messrs. S. McKnight & Co., ship-builders, Ayr, launched from their yard a steel screw steamer named the *Gascony* for the Moss Steamship Co., Limited, Liverpool, for their Bordeaux and Liverpool trade. Dimensions:—Length, between perpendiculars, 230 ft.; breadth, moulded, 31 ft.; depth of hold, 16 ft. 6 in.; built under special survey to class 100 A 1 in Lloyd's, and the Board of Trade requirements for passenger certificate. She has a poop 83 ft. long, extending over engine and boiler, with accommodation for engineers and officers; long bridge amidships, with accommodation for 30 first-class passengers, with house on bridge deck, containing wheel-house, chart and captain's rooms, smoke-room, and entrance to saloon, with flying bridge above. The vessel will be fitted with Rait & Gardiner's steering gear (Maginnis's patent), Clarke Chapman's steam windlass and capstan, and all the latest improvements for the efficient loading and discharging of cargo. The machinery, which is triple-expansion, will be fitted by David Rowan & Son, Glasgow; cylinders, 20½ in., 33 in., and 54 in. diameter, by 33 in. stroke. Double-ended boiler, 17 ft. 6 in. long, by 13 ft. diameter, 160 lbs. w.p., and four steam winches. The construction of the vessel and machinery has been carried on under the superintendence of Messrs. William Esplen & Son, Liverpool, to their plans and specification.

**Thrush.**—On October 10th Messrs. Scott & Co., Greenock, launched the second of two gunboats for the Government. Both vessels are composite, with steel framings, and two thicknesses of teak planking. Length, between perpendiculars, 165 ft.; extreme breadth, 31 ft.; draught of water forward, 10 ft. 3 in.,

and aft, 13 ft.; free board, 4 ft. 3 in.; and tonnage, 805. The machinery will be propelled by triple-expansion engines of a horizontal type, capable of developing 1,200 H.P. The armament of the vessel consists of six 4-in. guns, two quick-firing guns, and four Nordenfelts. Both vessels have been built from the design of Mr. W. H. White, Chief Constructor of the Navy, and have been superintended during their building by Mr. Allan, Admiralty overseer, Chatham Dockyard. The machinery has been constructed under the charge of Mr. J. A. Bedbrook, R.N. The vessel was named the *Thrush* by Miss M. S. Scott, of Hawkhill. The sister ship to the *Thrush* was launched a fortnight ago, and is named the *Sparrow*.

**Irex.**—On October 10th Messrs. John Reid & Co., Port-Glasgow, launched a large sailing ship for Messrs. J. D. Clink & Co., Greenock. Length, 300 ft.; breadth, 43 ft.; depth, 25 ft.; 2,368 tons register. She was named the *Irex* by Miss Maggie Clink, of Greenock.

**Bankholme.**—On October 12th the Grangemouth Dockyard Co. arranged to launch their first steel sailing barque from their shipbuilding yard at Kellybank, Alloa, being the fourth built at the yard. The ship was christened the *Bankholme* by Miss Carlisle, Dublin, but unfortunately as she was leaving the ways the stern of the vessel stuck in the mud, leaving it partly upon the ways and partly in the water. Every effort was made by steam tugs to get the ship off, and it was hoped that at the next high tide this would be accomplished. The vessel is 218 ft. long; 36 ft. in breadth; depth of hold, 22 ft.; her registered tonnage being 1,200 tons. The ship was built to the order of Messrs. W. Just & Co., Liverpool.

**Samara.**—On October 12th Messrs. Mackie & Thomson launched from their shipbuilding yard, at Govan, the *Samara*, a steel screw steamer of about 1,700 tons gross, built to the order of Messrs. MacLay & McIntyre, Glasgow, and intended for their general trade. Her dimensions are:—Length, 260 ft.; breadth, 36 ft. 9 in.; depth, moulded, 19 ft. 2 in. She will be fitted by Mr. William Kemp, Govan, with triple-expansion engines of 800 I.H.P., with cylinders 18 in., 29 in., and 46 in. diameter by 39 in. stroke. She was named as she left the ways by Mr. McIntyre, wife of one of the owners.

**Bellanoeh.**—On October 14th there was launched from the yard of Messrs. D. & W. Henderson & Co., Partick, for Messrs. Bell Brothers & McLelland, Glasgow, a fine steel screw steamer of 2,770 gross register, to be fitted with triple-expansion engines and all recent improvements. The steamer, we understand, will be employed between Liverpool and the River Plate. As she left the ways she was named the *Bellanoeh* by Miss Laura McLelland, daughter of one of the owners.

**Mariposa.**—On October 15th Messrs. Blackwood & Gordon launched from their building yard, at Port-Glasgow, the first of two screw steamers for Messrs. James & Alexander Allan, of Glasgow, of the following dimensions:—Length, 153 ft.; breadth, 28 ft.; depth, 9 ft. 6 in.; and to be fitted with triple-expansion engines by her builders. On leaving the ways she was named *Mariposa* by Miss Blackwood, daughter of the senior partner of the firm. This vessel and her consort are intended to act as feeders to Messrs. Allan's larger steamers at the River Plate. Messrs. Blackwood & Gordon are also building two large sailing schooners for the Messrs. Allan's River Plate trade.

**Zamora.**—On October 25th there was launched from Messrs. Ramage & Ferguson's shipyard, at Leith, a steel screw steamer named the *Zamora*, built to the order of Messrs. James Currie & Co., Shipowners, Leith, for their Baltic and general trade. The principal dimensions being:—Length K. and F., 249 ft.; breadth, 33 ft.; and depth, moulded, 18 ft. 4 in. The engines, which are also supplied by the builders are triple-expansion with cylinders 18 in., 30 in., and 48 in. diameter, and 36 in. stroke, supplied with steam from a large single-ended steel boiler. The *Zamora*, on leaving the ways, was named by Miss E. M. Rankin, 6, Fulwood Park, Liverpool.

#### LAUNCHES.—IRISH.

**Nawab.**—On September 28th Messrs. Harland & Wolff launched from their shipbuilding yard, at Belfast, a large screw steamer, named the *Nawab*. She has been built to the order of the Asiatic Steam Navigation Co., Liverpool, and is intended for the East Indian trade, and has been built with a view to the requirements of the trade. The following are her dimensions:—Length, 345 ft.; breadth, 43 ft.; gross tonnage, 2,870. The *Nawab* will be fitted with triple-expansion engines of the most improved type, also constructed at the Queen's Island Works.

## LAUNCHES.—DANISH.

**Asta.**—On October 3rd there was launched from the yard of the Elsinore Iron Shipbuilding & Engineering Co., Elsinore, Denmark, the new steamer *Asta*, built for the Ostersøen Steamship Co., Copenhagen. The *Asta* is built entirely of steel, and is 148 ft. long, 24 ft. broad, and 11 ft. deep in the hold; she is fitted with compound surface-condensing engines of 250 I.H.P. The *Asta* is the first of four steamers ordered by the above company.

**Chr. Broberg.**—On October 5th there was launched from the shipyard of Burmeister & Wain's Shipbuilding & Engineering Co., Copenhagen, the new screw steamer *Chr. Broberg*, built for the United Steamship Co., Copenhagen. She is of steel, and is 218 ft. long, 31 ft. broad, and 23 ft. deep. The engines are on the triple-expansion principle, and the *Chr. Broberg* is intended for the Mediterranean trade. The same shipbuilding company has within the last few days delivered to the Danish State Railways the new paddle ferry boat the *Dagmar*. She is 166 ft. long, 26 ft. broad (43 ft. across the paddle-boxes), and 13 ft. deep. She is built of steel and fitted with comparatively powerful compound engines. The official trial trip took place October 4th, and the steam ferry left the following day for her destination at Maaesund.

## TRIAL TRIPS.

**Wyndcliffe.**—The s.s. *Wyndcliffe*, built by Messrs. Craig, Taylor & Co., Stockton-on-Tees, and engined by Mr. Middleton Pratt, of Huddersfield, had recently what might be called a trial trip from Middlesbrough to London, part laden, when the engines gave the builders' and owner's representatives thorough satisfaction. These are the largest engines as yet made by Mr. Middleton Pratt; and we understand he has the order for a similar set for the *Sir Walter Raleigh*, lately launched at Stockton. This is the third vessel built by Messrs. Craig, Taylor & Co. for Messrs. Douglas H. Morgan & Co., of Newport, Mon.; and we understand they have contracted for another. Although the vessel was very much out of trim, and the voyage made under boisterous weather, a speed of close on 10 knots was maintained during the time she was steaming. We also understand that Messrs. Craig, Taylor & Co. have sold their s.s. *Oakwell* to Messrs. Robert Candlish & Son, of Seaham Harbour.

**Essen.**—On September 10th the new screw steamer *Essen*, built for the Hamburg Australian Co. by the Flensburg Shipbuilding Co., made her first trial trip. She is built of German steel, and classed 100 A 1 at Lloyd's, and 1st Div. Veritas. She is 320 ft. by 40 ft. by 27 ft., and will carry 3,800 tons. She has double bottom, and is divided into seven watertight compartments by bulkheads reaching the upper deck. She has two steel decks, one of which is covered with wood. The whole ship is lighted by electric light in all compartments, and has Suez-Canal light on the fore-stem. In the elegant cabin is room for 12 first-class passengers. The poop accommodates 250 emigrants. The engine has a power of 1,500 I.H.P., which gives a speed of 12 knots by a consum. of  $1\frac{1}{2}$  lbs. The engine and all workmanship on board is finished in a very substantial way, so that the owners, who partook in the trip, expressed the greatest satisfaction. This steamer was ordered last of seven sister ships to be built for this line by six different shipbuilders as a sort of reserve ship, has been delivered as No. 2 of the whole lot, and has already a full cargo on board for her first voyage.

**Twilight.**—On September 20th the steel screw steamer *Twilight*, built by the Grangemouth Dockyard Co. for Messrs. John Wood & Co., West Hartlepool, for the Baltic trade, went on her official speed trial run on the Firth of Forth with very satisfactory results. The steamer is 260 ft. long, 33 ft. beam, and 17 ft. deep, and has engines on the triple-expansion principle, constructed by Messrs. Hutson & Corbett, Glasgow. The cylinders are 18 in., 30 in., and 48 in. in diameter respectively, and they have a piston stroke of 36 in. Steam is generated in one single-ended boiler 15 ft. by 10 ft., having four furnaces with ribbed flues, 3 ft. 2 in. in diameter, and having a total heating surface of 2,100 square feet. The horse-power indicated on trial was 900, and the speed attained  $10\frac{1}{2}$  knots per hour.

**Stella.**—On September 21st the new steel screw steamer *Stella*, built by the Flensburg Shipbuilding Co., made her trial trip. This steamer belongs to the regular line Flensburg-Stettin, and has the following dimensions:—163 ft. by 25 ft. 5 in. by 13 ft. 3 in. She is classed 1st Div. in Bureau Veritas. The

engines, of 315 I.H.P., worked most satisfactorily, and gave a speed of  $9\frac{1}{2}$  knots, which for the purpose was deep loaded with sand ballast.

**Craiglee.**—On September 24th this steamer, lately launched by the Campbeltown Shipbuilding Co., Campbeltown, went down the river on her official trial trip, after adjusting compasses. The owners and a large company of ladies and gentlemen joined the steamer at Gourrock, and she then proceeded to run the measured mile at Skelmorlie. The *Craiglee* has been built to the order of Messrs. Biggart and Fulton, Glasgow. She is a steamer of 3,300 tons deadweight, and is fitted with all the latest improvements, including Harfield's patent steam windlass, Alley & Maclellan's steam steering gear, and Smith's patent simplex feedwater heater and circulator. The engines, which were supplied by Messrs. Muir & Houston, Glasgow, are triple-expansion, and worked admirably on the trial trip. During two runs of the measured mile at Skelmorlie the speed of 11, 1-10 and 12 knots respectively were attained, showing a mean of over  $11\frac{1}{2}$  knots.

**Saragossa.**—On September 24th the steamer *Saragossa*, which has been built by Messrs. William Jobson & Co., of Low Walker, to the order of Messrs. Henry Scholefield & Son, shipowners, Newcastle, was taken to sea to make a full steam trial of the engines, which have been constructed by Messrs. Alley & M'Lellan, of Glasgow, under the superintendence of Mr. Alexander Taylor, of Newcastle, and Mr. Neish, of Glasgow. The day being favourable, a speed of fully 11 knots per hour was obtained. After a few runs over the measured mile, the vessel was taken into Tyne Dock to load for Genoa.

**Penguin.**—On September 26th the trial trip of the most recent of the line fishing steamers built at Leith, took place on the Forth. The steamer, named the *Penguin*, has been built by Messrs. J. Mackenzie & Co., of Leith, for Mr. Cunliffe, of Edinburgh, and has been engined by Messrs. Cran & Co., of Leith. She is 75 ft. in length by 17 ft. of beam, and is the fifth of her kind which Messrs. Mackenzie & Co. have built for the same owner. Very satisfactory results were recorded, an average speed of nine knots an hour having been attained. A fresh breeze afforded an opportunity of testing her under canvas as well as steam, and here also with very satisfactory results.

**Aurora.**—On September 26th the steamship *Aurora*, a new vessel, 313 ft. 8 in. by 40 ft. 6 in. by 22 ft.  $1\frac{1}{2}$  in., built by Messrs. Kopper & Son, of Stockton-on-Tees, for Messrs. Rickinson, Son & Co., of West Hartlepool, left the Tees on her trial trip, which was in all respects satisfactory. Her engines were built by Messrs. Blair & Co., Limited, of Stockton-on-Tees.

**St. Fergus.**—On September 27th the steamer *St. Fergus*, lately built and engined by Messrs. Fleming & Ferguson, Paisley, for the Wick and Pulteneytown Steam Shipping Co., went down the Clyde on her official loaded trial, and on the measured mile, with 520 tons deadweight on board, attained a mean speed of 11 575 miles, which was highly satisfactory to the owners. This steamer is fitted with the builders' patent quadruple-expansion engines, and considerable interest was taken in the trial. The engines worked without a hitch, and the absence of vibration, which is a feature of these engines, was particularly noticeable. After loading party at Greenock, she proceeded on her voyage to Stettin.

**Hippomenes.**—On September 27th this steamer, built by Messrs. Workman, Clark & Co., Limited, Belfast, for Messrs. R. P. Houston & Co., of Liverpool, went on her trial trip. The vessel is of the following dimensions:—320 ft. 4 in. long, 40 ft. 2 in. broad, and 26 ft. deep, and will carry 4,000 tons cargo. She is fitted with all the latest improvements, including water ballast, steam steering gear, windlass, &c., and has her after hold fitted up for carrying about 400 tons of frozen meat. The engines are by Messrs. Bow, M'Lachlan & Co., Paisley, and of the triple-expansion type, with cylinders 24 in., 40 in., and 64 in. in diameter, by 45 in. stroke, supplied by steam at 160 lbs. working pressure by two double-ended boilers. The trial was a run of six consecutive hours at full speed, and throughout this period the engines worked with great smoothness, the boilers giving an easy command of steam. The speed attained over the whole distance was a mean of over 13 knots per hour, the result being deemed highly satisfactory.

**Uranus.**—On September 28th the steamship *Uranus*, built by Workman, Clark & Co., Limited, of Belfast, and engined by Messrs. Muir & Houston, of Kinning Park, Glasgow, went her official trial, half laden. A run was made from Cloch to Pladda and back, and, in spite of the unfavourable state of the weather, the vessel kept up a speed during a six hours' trial of

13½ knots, being half a knot over the guaranteed speed. The *Uranus* is built for mail service in the Philippines, and is fitted for 50 first-class and 20 second-class passengers.

**Hanover.**—On September 28th the steamer *Hanover*, which was launched on August 26th last, proceeded over the Tyne Bar on her trial trip, with a full cargo of 2,470 tons. The *Hanover* has been built to the order of the Yorkshire Coal & Steamship Co., Goole, by the Edwards' Shipbuilding Co., of Howdon-on-Tyne. The engines were constructed by Messrs. Kincaid & Co., Greenock, and the boilers by Messrs. Jos. T. Eltringham & Co., South Shields. The trip was most satisfactory. The *Hanover* afterwards proceeded on her voyage to Civita Vecchia.

**Burgermeister Petersen.**—On September 28th the trial trip of the tank steamer *Burgermeister Petersen*, built at the Walker yard of Messrs. Sir W. G. Armstrong, Mitchell & Co., to the order of Messrs. G. J. H. Siemens & Co., of Hamburg, took place. The vessel is built of steel, to the highest class at Veritas, and has a capacity of 4,100 tons. She has powerful Worthington pumps, with very complete pumping arrangements for dealing with her cargo. The engines are of the triple-expansion type, by the Wallsend Slipway & Engineering Co., and after a very full set of runs on the measured mile a mean speed of 10½ knots was attained.

**Itafa.**—On September 28th this handsome steamer, built to the order of Messrs. J. T. Rennie & Co., of London and Aberdeen, by Messrs. Hall, Russell & Co., of Aberdeen, was taken for trial. She is 270 ft. 4 in. long, 35 ft. 2 in. broad, with a depth of 23 ft. 6 in., and is fitted with cylinders 21 in., 34 in., and 57 in. diameter, and 42 in. stroke, fed with steam of 160 lbs. pressure from two powerful boilers, and has feed heater and evaporators, besides other modern improvements for economising. She carries Board of Trade passenger certificate, and is arranged both amidships and aft for passengers, the berths being fitted in Messrs. Rennie's usual first-class style, and lighted, together with the whole ship and engine room, by electricity. A strong wind was blowing off the land, and rendered accurate trial data impossible; her speed noted on the measured mile, however, 13.68 knots. She afterwards left for London at four o'clock, and arrived off Gravesend in about 36½ hours, the machinery working in a most satisfactory manner, and giving no trouble whatever. A high speed was maintained throughout. Messrs. Rennie and a party of friends, including one of the consulting engineers, Messrs. Hanney, Baggallay & Johnson, of London and Liverpool, came round with the ship.

**Narciso Deulofen.**—On September 30th the official trial trip of the screw tug *Narciso Deulofen* took place. This vessel has been built for foreign owners, and has many important features in design for vessels of her class. Her dimensions are 105 ft., between perpendiculars, by 18 ft. 6 in. by 11 ft.; the hull is of steel, built to Lloyd's rules for the 100 A 1. Accommodation for passengers is provided forward of the machinery; the saloon is lofty, and ample ventilation is given from skylights on raised deck. Galley and bath-room are also fitted for use of passengers. As is now usual, the officers and crews' quarters are provided aft. The engines are triple-expansion three crank, and are supplied by steam at 150 lbs. from large steel boilers with two of Fox's corrugated flues. The true mean speed over a 6-knot course was close upon 12 knots per hour with the engines indicating 460 H.P., being in excess of the guarantee. After the speed power trial was completed, the centrifugal pump, fitted for salvage purposes, and capable of discharging about 350 tons per hour, was tried, as also the special fire pump. In the evening the incandescent electric lights with which the vessel is fitted throughout were tried, and also a powerful search light of 16,000 candle-power. The electrical appliances were supplied and fitted by Messrs. Parsons & Co., also a double-cylinder steam winch for salvage purposes. The scantling and outfit were considerably in excess of Lloyd's rules, and make the vessel most complete. The performances of vessel and machinery gave complete satisfaction to the superintendent engineer, Mr. Ashbridge, of Liverpool.

**Royal Prince.**—On October 1st the large iron screw trawler *Royal Prince*, built to Lloyd's class throughout by Messrs. J. T. Eltringham & Co., South Shields, and engined by Messrs. Baird & Barnsley, Bull Ring, North Shields, to the order of Mr. W. H. Storey, had a highly satisfactory trial at sea. The boat behaved admirably, and against a heavy sea and adverse tides, both in running to and from Hartlepool, a speed of between 9 and 10 knots was easily obtained. The dimensions of the vessel are 93 ft. long, 100 over all, 8½ ft. broad, and

10½ ft. deep. She is fitted with boilers and engines, working at a pressure of 100 lbs. per square inch, having cylinders 16 in. and 32 in. by 22 in.

**Mary Thomas.**—On October 1st the screw steamer *Mary Thomas*, of Cardiff, Captain Venables, recently launched from the Howden yard of Palmer's Shipbuilding & Iron Co., was taken out on her trial trip. The vessel had on board considerably over 3,000 tons of coal, and ran the mile in a lumpy sea at the rate of 9½ knots an hour, the mean draught of the vessel being 20 ft. 9 in. The engines did their work smoothly and regularly.

**Blarney.**—On October 2nd the new steamship *Blarney*, lately built by Earle's Shipbuilding & Engineering Co., Limited, Hull, to the order of the City of Cork Steam Packet Co., Limited, for the Irish Channel passenger and cattle trade, and for general cargo purposes, was taken out for trial trip. A preliminary run out to sea was made, and all being found satisfactory, the vessel was brought back to Grimsby Roads, where she was anchored for the night. Early on Thursday morning the anchor was got up, and the ship left Grimsby for a long run at sea. On reaching Newsand Light she was run full speed to Flamborough Head and back, maintaining a speed throughout the run of upwards of 13 knots, the engines running very smoothly at 83 revolutions per minute. A series of six runs was then made on the measured mile at Withernsea at the above number of revolutions, and the speed shown on the long run was fully confirmed. The *Blarney* then returned to Hull, being worked at full power as far as the *Bull* Lightship in the River Humber, having proved herself not only a fast ship, but also a very comfortable one at sea, and doubtless she will be found a favourite vessel by passengers on the Irish service. On behalf of the City of Cork Co., the following gentlemen attended the trial, viz.:—The chairman, Major Lyon; the secretary, Mr. de Foubert; Mr. Calvert, superintendent engineer, and his assistant, Mr. King, and Captain Leyne, who will be in command of the ship, and these gentlemen all expressed themselves fully satisfied with the performance of the vessel. Mr. Seaton, the general manager of Earle's Shipbuilding Co., accompanied the *Blarney* on Wednesday some distance down the river, and the builders were also represented throughout the trial by Mr. F. H. Pearson, assistant manager; Mr. Cole, shipyard manager; Mr. W. B. Dixon, engineer manager; and Mr. T. Marshall, electrician. The following is a description of the vessel:—The ship has a straight stem, elliptic stern, is schooner rigged, and the leading dimensions are: 256 ft. 6 in. by 33 ft. beam by 18 ft. 7½ in. depth, the greater portion of the upper deck being covered by the poop, bridge, and forecastle. Accommodation for a large number of first-class passengers and for the officers is provided under the poop, and comprises saloon, smoke-room, ladies' room, gentlemen's room, and every convenience. The saloon is carried out in polished woods, is well lighted by a large skylight and upholstered in morocco leather, the entrance to this and the smoke-room are in walnut, handsomely decorated with marble panels and ornamental tiles. A large ornamental cupola is fitted on top of the saloon entrance, and has a very pleasing effect; the ship has also been fitted by the builders with the electric light throughout. The forecastle has accommodation for crew and deck passengers, and a barrack-room is also provided. The remaining portion of the upper deck, as well as the 'tween decks and holds, are arranged and fitted up for the carriage of horses, cattle, and sheep. Powerful cranes are provided for working cargo. Steam steering gear, by Alley & Maclellan, is fitted amidships, and screw gear aft. The compasses have been supplied by Messrs. Bassett, of Liverpool, and a Calvert patent reply telegraph is fitted on the bridge. The machinery consists of a set of triple-compound inverted engines, also manufactured by Earle's Co., and having cylinders 24 in., 38 in., and 62 in. diameter by 42 in. stroke, and two large steel boilers for a working pressure of 160 lbs. per square inch.

**Earndale.**—On October 3rd the screw steamer *Earndale*, Captain Mumford, recently launched from the Jarrow yard of Messrs. Palmer & Co., was taken on her trial and compass-adjusting trip. The runs on the measured mile indicated an average speed of 11½ knots an hour.

**Haytor.**—On October 3rd the s.s. *Haytor* was taken on trial trip off the Tees, with very satisfactory results. The vessel, which is 250 ft. by 35 ft. by 18 ft. 4 in., has been built by Messrs. R. Craggs & Sons, Middlesborough, for Messrs. Jno. Holman & Sons, London. The engines are by Messrs. Westgarth, English & Co., Middlesborough, and have cylinders 18½ in., 29 in., 49 in., by 36 in., with two large steam boilers, 16½ lbs. working pressure.

**Bungaree.**—On October 3rd the new steamer *Bungaree*, built by Wigham, Richardson & Co., Low Walker, to the order of W. Lund, Esq., of London, was taken to sea for her trial. This vessel, which is intended for the Australian trade, is the seventh that has been built by this firm for the same owner. She is 335 ft. long, 42 ft. broad, and 28 ft. deep, moulded, and was built under special survey to class 100 A 1 at Lloyd's. The engines are also by Wigham, Richardson & Co., cylinders 28 in., 45 in., and 73 in., with stroke of 48 in., boilers to work at 150 lbs. She is designed to carry 4,500 tons deadweight, and is fitted up for first and third-class passengers; she will also be placed on the Admiralty list. The trial trip was in every way satisfactory, and a mean speed of 13½ knots was attained.

**Realm.**—On October 3rd the steel screw steamer *Realm*, 1,660 tons gross register, recently launched by Messrs. Ramage & Ferguson, Leith, for Messrs. R. Conaway & Co., Liverpool, went on her trial trip on the Firth of Forth. On the measured mile at Gullane the mean speed of several runs was found to be 10.75 knots, and during the whole day's steaming the engines worked in the most perfect manner. The *Realm* is built to the latest and most improved design as a well-deck steamer, with poop, quarterdeck, long bridge to fore hatch, and topgallant forecabin; her dimensions being:—265 ft. K. and F. by 36 ft. 6 in. beam by 18 ft. 4 in. depth, moulded; the engines also made by Messrs. Ramage & Ferguson, being triple-expansion, with cylinders 21 in., 34 in., and 56 in. diameter, by 36 in. stroke, supplied with steam from two steel boilers working up to 160 lbs. Water ballast is provided in a continuous cellular double bottom, and the rig is that of a two-masted topsail schooner, a novelty being that the masts are perfectly perpendicular instead of being raked as usual; an arrangement which allows the cargo derricks to work in a much more satisfactory manner than is commonly the case. The vessel, during construction, has been superintended by Messrs. Ashlin and Asbridge, Liverpool. Her first voyage will be from Leith to Genoa.

**Bee.**—On October 4th this vessel, built by Messrs. Macgill & Co., of Irvine, and engined by Messrs. Muir & Houston, of Glasgow, for Messrs. Knowles & Robins, Hull, went on her trial trip, and attained a speed of 10½ miles, which was considered highly satisfactory. Her dimensions are:—Length, 100 ft.; breadth, 20 ft. 6 in.; depth, 11 ft.; with triple-expansion engines, cylinders 11 in., 16½ in., and 27 in., by 22 in. stroke; large boiler, 160 lbs. working pressure. The vessel has been specially designed and fitted as a North Sea trawler with all the latest improvements, and left same night for the fishing ground.

**Aconagua.**—On October 4th this handsome new steel screw steamer proceeded down the Firth of Clyde on her official trial trip, with a select party of ladies and gentlemen on board. The *Aconagua* has been built by Messrs. John Reid & Co., Port-Glasgow, to the order of the Compania sud Americana de Vapores, Valparaiso, through Mr. Thomas Dewsbury, who represents the company in this country. This vessel is much similar in type to the *Maipo*, *Laja*, *Amazonas*, &c., previously built by Messrs. John Reid & Co. for this company for their magnificent fleet of mail and passenger steamers on the West Coast of South America. The *Aconagua* is 360 ft. in length, 40 ft. beam; she has three masts, two funnels, and four decks. The awning and shade decks are of teakwood, whilst the main deck is of steel, sheathed with pine. The entire main deck and part of the lower deck have been fitted for the conveyance of about 1,000 steerage passengers. The awning deck is devoted exclusively to first-class passengers. The state-room accommodation, and fittings provided there for about 180 passengers, are all of the most luxurious description, a proportion of the state-rooms being *en suite*; whilst special attention has been paid to the ventilating arrangements. A most complete system of electric lighting has been fitted throughout the entire vessel; electric bells are also fitted to all the accommodation. The machinery has been constructed by Messrs. John & James Thomson, Glasgow. It is of the triple-expansion type, and in every detail is of the most approved and complete description, and throughout the trial worked with great smoothness and to the entire satisfaction of all concerned. The speed attained by the vessel on trial, and with a full cargo on board, was 15 knots. The construction of the vessel and machinery has been superintended throughout by Mr. Thomas Dewsbury. The *Aconagua* will be commanded by Captain Roberts, late of the s.s. *Lautaro*, belonging to this company, and at present at Port-Glasgow for repairs; whilst Mr. Wylie, who is well known in the company's service, will take charge of the machinery department. The

vessel, on reaching her destination, will take up her station, carrying mails, passengers, and cargo between Valparaiso and Panama.

**Parkgate.**—On October 4th this steamer, 289 ft. 6 in. by 38 ft. by 20 ft. 3 in., built by Messrs. Thomas Turnbull & Sons, of Whitby, for Messrs. Turnbull, Scott & Co., of London, left the Tees for her trial trip. Her engines are of the triple-expansion type, of 175 H.P. nominal, having cylinders 22 in., 36 in., 59 in. in diameter by 39 in. stroke, and working at 160 lbs. pressure of steam. They have been built by Messrs. Blair & Co., Limited, of Stockton-on-Tees. The vessel made a most successful run, everything working satisfactorily, the speed attained being about 9 knots, loaded ship.

**Iona.**—On October 5th the steel screw steamer *Iona* left the South Dock, Sunderland, on her trial trip. She has been built by Messrs. Robert Thompson & Sons, of the Southwick yard, for Messrs. Speeding, Marshall & Co., of the Iona Steamship Co., Limited, under the superintendence of Mr. J. R. Scott, Newcastle. The dimensions are:—Length, 260 ft.; breadth, 36 ft. 6 in.; depth, moulded, 19 ft. 3 in. She is of the well-deck type, having short poop, long bridge to foremast, topgallant forecabin, cellular double bottom for water ballast, four large hatches, four powerful winches, with large donkey boiler, patent windlass, stockless anchors, steam steering gear, lighthouses on forecabin, and all the most modern improvements. Her engines are triple-expansion, by the North-Eastern Marine Engineering Co., of Sunderland, having cylinders 20 in., 32½ in., and 58 in. diameter, with a stroke of 36 in., and two large steel boilers, with a working pressure of 160 lbs. The tests to which the vessel was put were in every way satisfactory, she attaining a speed of about 10 knots with a cargo of 2,500 tons of coals.

**Rannoch.**—On October 8th the official trial trip of the screw steamer *Rannoch* took place over the measured mile. The speed attained was fully up to the owner's expectation, being 10 knots mean, the vessel being loaded with a full cargo of 2,800 tons. The steamer was built by Messrs. Murdoch & Murray, Port-Glasgow, and engined by Messrs. D. Rowan & Son, Glasgow, under the superintendence of Captain Gibb, ship surveyor, and Mr. Cormack, engine surveyor. The boilers are fitted with Smith's patent simplex feedwater heater and circulator, which gave every satisfaction.

**Burton.**—On October 8th the s.s. *Burton* was taken on loaded trial trip with very satisfactory results to all concerned. The vessel, which is 195 ft. by 28 ft. 6 in. by 14 ft. 2½ in., has been built by Messrs. R. Craggs & Sons, of Stockton, for W. F. Beaumont, Esq., of Boston, for his Hamburg line of traders. The engines are 16½ in., 26 in., and 44 in. by 38 in., and are built by Messrs. Westgarth, English & Co., of Middlesbrough.

**Lillian.**—On October 9th the s.s. *Lillian* was taken on trial trip. The dimensions of the vessel are 231 ft. 6 in. by 32 ft. by 16 ft. 2 in. She has been built by Messrs. Irvine & Co., of West Hartlepool, for Messrs. Allison & Co., of the same port. The engines, which are 16½ in., 26 in., and 44 in. by 38 in., have been supplied by Messrs. Westgarth, English & Co., of Middlesbrough. The owner and his representative on board were perfectly satisfied with the performance of the vessel and her machinery, and they took her at once into the Tees to load for the Baltic.

**Indiana.**—On October 9th the s.s. *Indiana*, which has been built for Messrs. Bailey & Leatham, of Hull, by Messrs. Raylton, Dixon & Co., Middlesbrough, proceeded from the Tees on her trial trip. The chief dimensions of this boat are:—Length, 287 ft.; breadth, 38 ft.; depth, moulded, 21 ft. 9 in.; with a deadweight carrying capacity of 3,000 tons. She is built with raised quarter-deck, short poop aft, long bridge, and topgallant forecabin. Her engines, which have been fitted by Messrs. Westgarth, English & Co., and are of 170 N.H.P. with cylinders 21 in., 34 in., and 56 in. by 39 in. stroke, gave every satisfaction on trial. She has been built under the superintendence of Mr. Thos. Thompson.

**Ackworth.**—On October 12th the new steel steamer *Ackworth*, just completed by Messrs. Ropner & Son, of Stockton-on-Tees, for Messrs. Jos. Merryweather & Co., of West Hartlepool, had her trial trip from the Tees. After adjusting compasses the steamer proceeded northwards for a run, when everything was found to be quite satisfactory. The engines, which are by Messrs. Blair & Co., Limited, worked smoothly and well during the whole period.

**Attilita.**—On October 12th the steel screw steamer *Attilita*, built by Messrs. C. S. Swan & Hunter for Messrs. Zino, Fratelli, of Savona, went on her official trial. The principal dimensions of the vessel are 320 ft. over all, by 39 ft. by 25 ft. 3 in., moulded. Long full poop, fitted with handsome saloon

and accommodation for first-class passengers; bridge-house amidships for officers' accommodation, and topgallant fore-castle; also ventilation and all requirements for carrying emigrants as per Italian Government regulations. Water ballast in cellular double bottom throughout, steam windlass, steam steering gear, four powerful winches, and large donkey boiler. The engines are by the Wallsend Slipway Co., Limited; cylinders 23 in., 38 in., and 61 in., by 42 in. stroke, with two extra large boilers 160 lbs. pressure, steam starting gear, Kirkaldehy's feed make up, &c. The vessel, over a number of runs on the measured mile, obtained a mean speed of 12 knots, which was considered by Mr. Luigi Zino and the company present very satisfactory.

**Corennie.**—The fine screw steamer *Corennie*, of about 800 tons, which has been specially built for the herring trade by the Blyth Shipbuilding Co., Limited, of Blyth, is a handsome addition to the fleet of steamers owned by Mr. W. Todd Moffatt, of Aberdeen. This vessel had her official trial trip off the River Blyth on October 14. She was taken from the company's works during the morning, with the owner, builders, and others on board, and was tried over the measured mile, when the results obtained were perfectly satisfactory to all interested. The engines are triple-expansion, and have been supplied by Messrs. Blaikie Brothers, of Aberdeen. The *Corennie*, in charge of Captain Stephens, sailed for Aberdeen in the afternoon, after having her compasses adjusted by Messrs. C. & W. Hutchinson, South Shields.

**Avonmore.**—On October 14th this steamer, built by Messrs. Jos. L. Thompson & Sons, Sunderland, for Messrs. William Johnston & Co., of Liverpool, left Sunderland for her trial trip. She is supplied with triple-expansion engines of 222 H.P. nominal by Messrs. Blair & Co., of Stockton. Her trip was highly successful, a speed of 11½ knots being attained.

**Scotland.**—On the 15th October the trial trip of the s.s. *Scotland*, built by the Grangemouth Dockyard Co., at Grangemouth, took place in the Firth of Forth. On the measured mile a speed of 12 knots was obtained, being about half a knot in excess of what the owners expected. The vessel, which is handsomely modelled, and of very rakish appearance, has been built to the order of Messrs. Jeus Menich & Co., of Christiana, for their direct passenger and cargo trade between Christiana and Grangemouth, is 200 ft. by 28 ft. 9 in., 14½ ft. to main deck, and 21½ ft. to awning deck. She is fitted up handsomely to accommodate 60 first-class passengers, 80 second-class, and a large number of third-class or emigrants. The engines, which are of the triple-expansion type, were constructed by Messrs. Hawthorn & Co., Leith. They worked smoothly throughout, and indicated 700 H.P.

**Aska.**—On October the 16th the official trial of the new steamer *Aska* took place on the Clyde, when a mean speed of 12½ knots per hour was attained, the engines working with great smoothness, and indicating 900 H.P. The *Aska* has been built to the order of the British India Steam Navigation Co., Limited, by the Ailsa Shipbuilding Co., Troon, the engines being supplied by Dunsmuir & Jackson, Govan. The representatives of the owners, who were on board, expressed great satisfaction at the results obtained, as the speed of the vessel was considerably beyond, and the carrying power and stability was fully up to, the requirements of the contract.

**Godolphin.**—On the 16th of October the new steel screw steamer *Godolphin*, built by the Grangemouth Dockyard Co., at Alloa, went down the Firth of Forth on her official trial trip. She is of the usual well-deck type, with double bottom fore and aft for water ballast, and carries 2,300 tons deadweight on 18 ft. draught, is fitted up with all the latest improvements for working both ship and cargo, including direct steam windlass and a sentinel steam steering gear. The engines, which are of the triple-expansion type, were supplied by Messrs. Hutson & Corbett, Glasgow, indicated 850 H.P. on the trial. The engines worked smoothly throughout, and gave the greatest satisfaction to all concerned. The *Godolphin*, which has been built to the order of Messrs. William Lamplough & Co., London, will proceed to Hamburg under the command of Captain Millington, where she will load for America.

**Sophie Rickmers.**—On October 22nd, the screw steamer *Sophie Rickmers*, recently launched by Messrs. Russell & Co., Greenock, was tried at the measured mile at Skelmorlie, when a mean speed of 10½ knots was attained, a very satisfactory result. The machinery, which was constructed by Messrs. Dunsmuir & Jackson, Govan, was tested to its utmost extent, and gave full satisfaction to the owners' representatives. The engines are triple-expansion, cylinders 24 in., 39 in., 64 in. by

45 in. stroke, and the boilers are two in number, 12 ft. 6 in. diameter, by 15 ft. 6 in. long; working pressure 150 lbs. per square inch, all constructed under the surveys of Lloyd's and Bureau Veritas. There is a powerful ballast pump for water ballast, and also a duplex pump for feeding the boilers, and in case of a breakdown of the feed pump a large injector is fitted, capable of supplying the boilers at full speed. Rayner's patent apparatus for supplying the boilers with fresh water is also fitted. This vessel is the sister ship to the s.s. *Helene Rickmers*, built and engined by the same firms a few months ago, both of which have been built to the order of R. C. Rickmers & Co., Bremerhaven.

## Miscellaneous.

A NEWCASTLE paper states that a Tyne steamer engaged in the American trade has earned £3,821 in three months, and £25 per share has been divided out of that; a West Hartlepool steamer of 1,500 tons is said to have earned £14 per share in the like period in the Baltic trade.

**FAST OCEAN STEAMING.**—The Inman Liner *City of Paris* has made a fast passage from Sandy Hook to Roche's Point. The ship left the American coast on Wednesday, October 2nd, and crossed the Atlantic in 5 days 22 hours 58 minutes.

**THE "BALTIMORE."**—According to a Philadelphia telegram the official report on the trial trip of the new war ship *Baltimore* shows 8,977.88 average H.P. developed, being 22.12 deficiency, as the contract requires 9,000. The average speed reported is 19.6 knots. As two of the indicators broke during the trial, another trial will be held to test the H.P., though the Department have notified the builders that the ship will be accepted without it.

**THE WHITE STAR LINER "TEUTONIC."**—The officers of the *Teutonic* report that her smaller screws revolve 79 times per minute, which is a gain of nine revolutions. Although she beat the *City of New York*, and also her own best previous record, adverse weather prevented her making her greatest possible speed. She gains, on an average, 36 knots daily by burning 29 tons more coal. The engineer predicts that she will yet cross the Atlantic within an hour of five days.

**NEW WAR VESSELS.**—The German naval estimates for 1890-91 make provision to the extent of 32,000,000m. for building war vessels. This amount comprises a second instalment of 14,000,000m. on account of vessels in course of construction since last year, and a first instalment for laying down two new ironclads, three cruiser-corvettes, one cruiser, and three despatch vessels.

**ACCIDENT ON A CUNARD STEAMER.**—The Cunard steamer *Cephalonia*, outward bound from Liverpool to New York, which left the Mersey on the 23rd ult., put into Holyhead the following night, a somewhat serious accident having occurred on board on the way down the Irish Channel. One of the steam pipes in the engine-room burst, and the second engineer and four firemen were badly scalded. The injured men were taken to the Stanley Hospital, one of them in a hopeless condition.

**MR. R. J. SMITH**, late superintending engineer (eleven years in that position) to the Pinkney & Sons Steam Shipping Co., Limited, having resigned that appointment, has commenced business on his own account at Baltic Chambers, John Street, Sunderland, as consulting engineer and ship surveyor. Mr. Smith, having had the experience of overlooking the machinery of over 20 new steamers, as well as a great number of repair contracts at home and abroad, and holding, as he does, a first-class Board of Trade certificate, ought to achieve success in the new career he has marked out for himself.

**PASSENGER TRAFFIC ACROSS THE CHANNEL.**—Some interesting comparative statistics have been prepared with reference to the enormous passenger traffic between England and the Continent, *via* Dover and Calais and Folkestone and Boulogne, during the nine months ending September 30th. During that period 272,751 passengers travelled by the Dover and Calais route, showing the great increase of 74,602 over the corresponding period of last year. During the same period 90,584 persons crossed the Straits *via* Folkestone and Boulogne, the increase on the corresponding nine months of last year being 2,097. During September 47,843 passengers crossed *via* Dover and Calais, being an increase of 18,254 over last year; and 18,409 travelled *via* Boulogne, the increase being 3,821.

**THE GERMAN FLOATING EXHIBITION.**—The steamer intended for the German floating or travelling exhibition will probably be constructed by the Vulcan Co., Stettin. The vessel is to be

38 ft. long, 66 ft. beam, and 40 ft. depth of hold. The draught of water is not to exceed 20 ft., in order to enable the vessel to enter shallow harbours, and the carrying capacity would in that case be only 4,500 tons; but this could be raised to 6,500 tons if the draught of the vessel is increased. Loaded up to 4,500 tons, and provided with engines of 6,600 H.P., it is expected that at a speed of 14 to 15 knots will be attained. The coal bunkers are to have a capacity of 2,500 tons. Nine rooms are to be provided for exhibition purposes, each 66 ft. by 63 ft. should the speed be reduced to 12 knots, a great saving would be effected in coal and working expenses, while additional space could be provided for the exhibition, and the cost of the extended trip, which is to last two years, would be reduced by 25,000.—*Iron.*

**NEW GERMAN WAR VESSELS.**—The German Reichstag recently sanctioned the sum demanded by the Imperial Assembly for the extension of the German Navy, and provision was made in the Budget for 1888-90 for the construction of the following vessels:—The iron-plated vessels P and Q, the cruiser D, the ironclads A, B, C, and D, two torpedo-division boats, and the corvette H. The necessary designs have now been decided upon, and orders for the construction of the vessels have been given out. The two vessels, P and Q, have been given to the Weser Co., Limited, the cruiser D to the Imperial Dockyard at Kiel, and the two torpedo-division boats to the Schichan Works at Elbing. Of the four large ironclads, which are to have an unprecedented tonnage in German naval annals, two have been given to the Vulcan Co., at Stettin, and one to the Germania Works at Kiel, while the fourth will be built in the Imperial Dockyard at Wilhelmshafen. The construction of the cruiser corvette H has also been intrusted to the Germania Co. The total cost of this increase is estimated at £2,750,000. Of this sum nearly a million sterling will be due to the Vulcan Works, and about £800,000 to those of the Germania Co. All the plans have been worked out at the Admiralty, with the exception of those for the machinery and boilers for the four largest vessels, which have been supplied by the Germania Works at Kiel.

**BOILER EXPLOSIONS.**—Mr. Thomas Gray, the Assistant-Secretary to the Marine Department of the Board of Trade, in the course of his seventh report upon the working of the Boiler Explosions Act, 1892, states:—"During the 12 months ended June 30, 1889, preliminary inquiries have been held in 67 cases. By the explosions thus dealt with, 33 persons were killed, and 79 injured. The annual average of explosions inquired into during the six preceding years was 47, and of lives lost, 80. In upwards of one-third of the cases investigated, the explosions occurred on board vessels. The administration of the Merchant Shipping Act enables the Board of Trade, through their officers at the ports, to obtain information of every explosion on board ship; but in the case of land boilers, no system of the kind exists; and, unless an explosion has been attended by loss of life, or from some other cause is noticed in the public Press, the department has no means of ascertaining its occurrence if the owner of the boiler omits to report the fact, and there is good reason to think that many casualties occur to land boilers which escape official inquiry. The use of defective or worn-out boilers again constituted the cause of about one-half the explosions inquired into, while defective design or construction and undue working pressure accounted for nearly one-third, and ignorance or recklessness of the attendants about one-sixth of the total. Reference was made in the last annual report to the defective condition in which it is believed the boilers used for hoisting trawls are often worked; and boilers of this kind formed the subject of six inquiries during the past 12 months. In 22 of the cases inquired into during the year the boilers were under the inspection of boiler insurance companies, or of Lloyd's; but in seven of these the explosions were in no way attributable to the defective condition of the boilers or fittings. Legal proceedings were instituted in only one case during the year, the owners of the boiler referred to under Report No. 294 having been prosecuted and fined 20s. for omitting to report the occurrence within the time prescribed by the Act."

**THE NEW ATLANTIC PORT.**—The Anchor Line steamer *City of Rome*, which left New York on the 16th ult. on an experimental voyage to Milford Haven, was signalled off Browhead at half-past 5 o'clock on the morning of the 24th ult., and reached Queenstown at 8 a.m. The ship left Queenstown at five minutes to 10, and anchored at Dale Road, one of the many inlets within Milford Haven, at half-past 5 the same evening. It had been generally expected that the vessel would come up to the dock side and land her passengers and cargo without the intervention of a tender. For some reason this was not done.

There was some delay in getting the tender belonging to the Great Western Railway alongside, but this having been accomplished, the trans-shipment began about 6.30. The tender covered the few miles to the dock in good time. Temporary accommodation had been provided on the dock side for the reception of the 122 passengers and the 160 packages of luggage brought over. The Customs examination occupied a little over an hour, after which the passengers, who were all members of Barnum's company, were free to enter the special train. Having landed her passengers, &c., the *City of Rome* left for Liverpool. The Great Western Railway's special train from Milford to London consisted of two powerful engines, a van, ten saloon carriages, and baggage vans, the whole being illuminated with gas. The train, which started at 20 minutes past 10 o'clock, was under the charge of Mr. Lenny, superintendent of the line, who was assisted by Inspector Atkins and Inspector Salisbury Miles. The directors and officials of the Milford Docks Co. left with the train, and it was expected that the whole distance to Paddington would be covered in six hours and seven minutes.

## Reviews.

*The Journal of the Iron and Steel Institute.* (E. and F. N. Spon 125, Strand). No. 1, 1889.

This journal, now for the first time in its present form before us, we find to contain an immense amount of condensed information as to the iron and steel industries. The journal opens, as it should do, with details of the constitution and business of the Iron and Steel Institution, and with a full illustrated report of the President's address. The address contains most interesting reference to modern processes of iron and steel production and manufacture, and affords also somewhat a change to the constant prophecies of ironmasters, that steel only is the metal of the immediate future. The President, Mr. Kitson, reiterates the still existing demand for, and supply of, the best Yorkshire iron. He refers to his expressed opinion ten years ago "that a splendid material like best Yorkshire iron, whose properties enable it to endure without deterioration so much punishment in the hands of the smith and engineer, would for many years to come find a trusted place in the workshops of the world." As a result, at the present time, he states that "the works under his control have no fewer puddling furnaces to-day than they had ten years ago, and at the present moment everyone of these puddling furnaces is in full work." It would appear that there is no lack of evidence, that the best Yorkshire or Low-Moor iron has stood the test successfully of any amount of hard wear and tear both in boiler plates, chains, or axles; and that in spite of the various claims for excellence of modern steel, the best Yorkshire iron has gained a position for strength and reliability that it will take steel a long time to reach. The President then draws attention to many new labour-saving appliances, and to the latest developments in steam-hammers and forging processes. Mr. Kitson believes that the giant steam-hammer, which is in great demand in France up to 80 to 100 tons will be supplanted by the silent, slow working, but irresistible forging press.

The new hydraulic forging presses are being made up to a capacity of 4,000 to 5,000 tons. Steam-hammers are disadvantageous in their method of forging, by reason of the blow being abrupt and the force being absorbed chiefly on the surface of the forging, and if the hammer is under its work, it may tend to cause the forging to "pipe" and become hollow and unsound in the centre.

Electrical welding and the properties of wafer gas, and of many alloys are also touched upon by the President, who also gives late statistics of the shipbuilding trade.

After the publication of a series of papers communicated at the Institute by the leaders of the iron and steel trades, follows an obituary of many well-known and lamented members of the Institute, but after that, almost one-half of the journal is occupied by a most valuable abstract of "notes of the progress of the home and foreign iron and steel industries." Under the various different heads of ores, fuel, forge-mill machinery, production and treatment of iron and steel, their physical and mechanical properties, and analysis and statistics, we find all the latest results of the past few years condensed into a most interesting and practical form, serving well to keep the present generation up to the latest details of progress. The whole journal thus becomes one of the most valuable additions to the library of any engineer.

*Bergen's Marine Engineer.* W. J. Potts, North Shields.

We have before us a new edition of a book which already has made itself marked amongst all marine engineers, in the shape of a guide-book to assist engineers when preparing for the rather stiff examinations for certificates of competency. That the present edition is the sixth is excellent evidence of the general appreciation of this work. The book commences with full and accurate information as to the regulations for the examinations, and also the general rules appertaining to such examinations, any infraction of which might lead to unexpected disqualification. Certain hints of value are also given to the intending competitor which he will probably find very useful. Since the general arrangement of the subject-matter the information has been edited with a full and personal knowledge of the requirements of the candidates, acquired by a long and varied experience of daily successful tuition. For this particular examination, the body of the subject-matter consists, to the extent of about one-fourth, of various problems worked out.

The remainder consists of examples extracted from the examination papers, the examples being carefully worked out in a simple manner. The size of type and the printing is all that could be desired, and a portfolio of plates and diagrams amounting in all to about fifty, is externally attached to the outside cover of the book. There are some noteworthy diagrams, with explanatory matter for setting out the travel of the slide valve, and the method of adjustment. Any sea-going engineer who may desire to make the most of his practical experience in examination for a certificate of competency, cannot do better than carefully to work through such a text-book as this, so as to get his ideas into good order, and to support his practical knowledge by such an amount of theory and mathematics as will enable him to obtain full credit for his results of observation and experience.

*Service Chemistry.* By Vivian B. Lewes, F.I.C., F.C.S., Professor of Chemistry, Royal Naval College, Greenwich. W. B. Whittingham & Co., 91, Gracechurch Street, and the Charterhouse Press.

THIS book, which is beautifully got up with excellent type and illustrations, is a manual of chemistry, treated as practically as possible, and with as much attention as possible paid to its application in the Naval and Military Services. As it is supposed, with the limited time at the disposal of the officers of both the Naval and Military Services after they have fulfilled more obligatory professional work, it can hardly be expected that they would be able to extend their scientific studies over a complete and exhaustive study of chemistry. Professor Lewes has, therefore, sought in this manual to impress upon the student's mind all the necessary facts and investigations which shall lead to a proper understanding of Chemistry as applied to gunpowder and other explosives, mortar and cement, gun cotton, fuels, and other similar subjects of great practical utility in the Services. We note a very interesting practical chapter upon boiler incrustation. The causes and nature of deposits in boilers are fully described and explained. The danger from deposits of animal and vegetable fats, or oils, is especially reverted to, as arising from the super-heated steam breaking the oils up, and liberating the fatty acids, but the substitution of mineral oils of the right kind has almost done away with this trouble.

The general principles also of reliable anti-incrustators is defined, and a due warning is given against the use of acid mixtures for such a purpose, as they attack the boiler plates after the scale has been dissolved. Under the heading of fuels, besides coal and coke, a good deal of attention is given to the burning of petroleum; facts from the practice of the Russian gun-boats, as adopted by some of the vessels in the Black Sea fleet, are adduced, and the practical advantage in the reduction of the number of stokers employed, the prompt extinction of the fires, the absence of forced draught, and freedom from smoke, are all impressed upon the attention of the reader. The chemical combination of combustion, and the relative heat developed with various fuels are thoroughly investigated and defined. A large part of the work is devoted to information upon the various densities, formation, and decomposition of gunpowder, and the general manufacture of gun cotton is gone into in some detail: nitro-glycerine or dynamite, emensite, and roborite are not forgotten, and altogether the chapter on explosives must form valuable condensed information for the Services. The protection of the interior and exterior of ships is dealt with at some

length, and the principle of necessary exfoliation is duly explained. The whole book is excellent reading, as, even apart from its strictly technical character, it provides a large amount of useful information on especial subjects.

*The Tabor Steam Engine Indicator.* Abel Heywood & Son, Manchester; and Simpkin, Marshall & Co., London.

AN accurate knowledge of that which takes place within the steam cylinder of the engine is essential for the proper control and design of such an engine. The nature and construction of the indicator used for this purpose is, therefore, equally important to the engineer. The Tabor Indicator, which is fully described in the above small pocket text-book, is represented as being one of the most perfect at present in use as regards its sensitiveness and accuracy of working.

After due descriptions of the instrument, the pocket-book gives detailed instructions for the management and care of the indicator; then follows a large number of instances of various indicator diagrams. Much information as to the percentage of feed water corresponding with the various proportions of cut off in the cylinder is also given, and the method of computing horse-power from a diagram is explained. Information as to the allowance for clearance is also plainly set out, and an immense number of high pressure, condensing, and compound diagrams are given, with a large number of tables of the properties of steam, areas and circumferences of circles, and comparative English and metric mensuration tables. This book, although practically merely a descriptive pocket-book of a special instrument, we find to be so full of general information, and so excellently got up as regards both paper and printing, that we find the book worthy of mention as a useful reference book as to the general value and results to be obtained from cylinder indicators, and the meaning and interpretation of large varieties of indicator diagrams.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

### FAST PASSAGES.

To the Editor of THE MARINE ENGINEER.

SIR,—In your October issue I notice a letter on fast passages, and the writer informs us who makes and who mars the passage.

In the first place he agrees with your leader of July number, and then goes on to severely condemn it, as it is evident that the successful driving of the engines is the principal, if not the only factor that makes the passage. "Justice" seems to think that the pressure of steam is the only thing that goes to produce the speed of the ship, and it is very plain in most of his remarks that he is not much acquainted with the duties of an engineer, or the many details that go to produce the power of an engine, and as for his "simile" that a man who drives a winch has nothing to do with the quick discharging of a ship, I can only say it is a poor one.

I grant him that the captain has a great responsibility—*anxiety*—and runs a great risk in thick or doubtful weather; but to say that it is he who makes, or mars, a passage is another matter—a captain may mar a passage, but he cannot make it.

Again he says, "If an engineer does not keep the pressure that the boilers are designed to carry he fails in his duty," but I would remind "Justice" that if a captain does not run his ship when possible, he also fails in his duty, as much as the engineer who does not keep up the power of the engines.

He also says, "It is the captain who has to make a fast passage with his ship. The owners have given him charge of her and all she contains, and that the engineer cannot share

responsibility in any way." I don't suppose any one would sh to deny the great responsibility of a captain, as the head the ship, or detract in any way from the credit due to him d his officers in the navigation of the ship, but that credit ist cease with his own department, as far as the fast passage a ship goes.

Now "Justice" seems to think that an engineer has no possibility of his own whatever, notwithstanding he has a vrier examination and a more scientific training to go through reach a position as chief engineer of a ship like the *City of is*, and there cannot be the least doubt that the company I hold him responsible for any neglect of duty, and he would the man and not the captain who would have to account for and if he is in the wrong the captain would not share his grace, as he would be bound to do according to "Justice's" a of him being the only responsible man on board of the p.

There is no doubt that the captain and his officers did their ty; but they only navigated the ship, they did not drive it; d you might as well credit a guard with the quick running of train, as to give the captain all credit for a fast passage; but have always noticed that the captain takes the credit of a t passage, but will never take the discredit for a slow or un- ofitable one off the shoulders of an engineer.

Again he says, "If the engines break down and cannot be tified, the engineers are done, and the captain has to get his ip to port as best he may without the mighty factor that akes the great speed." But I could give "Justice" many tances where a ship has been disabled at sea through engines eaking down and steering gear giving way, where if it had t been for the practical turn of mind the engineers possessed, e would never have reached port, and I am afraid that if any those "greyhounds" ever happen to meet with such a lamity as the break down of the whole of their propelling iver, the captain's practical skill would not be much required.

Now I have read your very able leader of July number, and I unnot see anything in it where you wished to give any credit e engineer at the expense of the captain, but when a man ounces that he is going to reduce the time 12 hours, it is vident that it is only bounce, or else he is aware of some egiect if he personally can reduce the passage by that time; ut I fail to see where he can have anything to do with it, he ly has one road to go, and with such splendid compasses and eering capabilities, it is not so very difficult as "Justice" ould seem to think, and it is seldom that they will make a eassage without a sight of some kind, either the sun or stars to ut them on the right track.

In conclusion, I would recommend "Justice" to give a little redit where credit is due, or sign himself Injustice.

Hoping you will be able to give this a place in your valuable urnal, and thanking you in anticipation,

I remain yours, etc.,

C. D.

Belfast, October 19th, 1889.

### FAST PASSAGES.

To the Editor of THE MARINE ENGINEER.

SIR.—By your permission I will reply to a letter which ap- ared in the October number by "Justice," which is a very good me, and I should be glad if engineers could only get justice, hich no unreasonable persons ought to object to, but I fear ey would not get it from the person who wrote that letter. r he says that the engineer has no more to do with "fast asages" than the man who drives a winch has to do with the t discharge of a ship, which is but a poor comparison and ly shows how totally ignorant Justice is of the duties of ineers on board ship. I dare say his small brain leads him hink that all engineers have to do is to turn on the steam and he goes, precisely as a man would a steam winch as referred y "Justice." Poor fellow, are my words for a person like him. ain he says the captain is the man who makes or mars a eage, &c., which is simply nonsense in the extreme. I give the shipmaster great praise for placing the ship's head in a e position for the place the ship is bound to, and also great ise to the chief engineer for very carefully keeping the nes up to their utmost speed. But to my mind, the greatest ise is due to the designers of these splendid structures. Only ak of the brain work to shape and equip a ship such as the of Paris, or many others of the liners. Then the engineer- of these monsters, to put them through the water at the

rate of 17 or 18 knots an hour and sometimes faster. I feel assured that Mr. "Justice" has no idea of ship construction.

Mr. "Justice" also informs us that the shipmaster's constitu- tion has to pay the price for our fast steaming passages, which is simply absurd and ridiculous, as I shall show you for illus- tration. Suppose a steamer leaves Queenstown, Ireland, bound for New York, the ship's head of course is placed in that position, and the shipmaster enters the course in the order book; also that if any particular alteration in the weather, &c., takes place, "call me at once." Very frequently nothing extra- ordinary does occur, consequently the captain is not disturbed, but he comes and goes as he pleases and does his all night in night after night; and why not? He has qualified officers, Board of Trade men like himself, who would have to answer for their conduct in case of accident. I will grant that in foggy or very stormy weather the captain cannot rest, and I should like to know who can. Everyone who gets his livelihood on the mighty waters are conscious of its dangers. Now a word about the constitution of the engineer, who is in a temperature anything but pleasant, inhaling hot gases of various sorts too numerous to mention, which I should consider is slightly different from the atmosphere on deck; and I feel sure if a doctor was consulted he would say that the engineer's constitu- tion pays something towards the fast passages as well as the poor captain. Most probably neither the captain nor chief engineer suffer much.

Mr. "Justice" says the owners have given the captain charge of the ship and all she contains. I emphatically say no. I grant that the captain has charge of the ship, but not all she con- tains. The chief engineer has charge of the boilers and engines and their efficient working. The doctor has his particular charge administering to the folks on board in case of sickness or accident. The chief steward has a very responsible charge in administering to the comforts of the passengers, and giving the company a good name for well-served dinners, &c., and thereby gaining patronage. I say, Mr. Editor, all the officers I have before mentioned point in one direction, which is to safety, speed, and comfort of passengers, and justice to the owners who risk their capital, and to the designers of these splendid struc- tures which cross the mighty deep. For the information of Mr. "Justice," I may say that the reason the Board of Trade were wise enough in giving the shipmaster the keys of the safety- valves of the boilers is simply that any alteration of the pres- sure of steam on the boilers would have to be done between two parties, and would sure to come to light. It would enlighten me if Mr. "Justice" will show me how a shipmaster is responsible for the lives of all on board, as he says he is. For example, suppose a boiler explodes, or some gases in the coal-bunker or elsewhere explode and kill people, or the doctor that treats a person for the wrong complaint, which causes death; again, if the copper stew-pans are not kept properly clean, and people are poisoned (all this has happened on board steamers in my time, and I have been in some of them), is the shipmaster responsible? I say no. Then who is? Why, the person who has that particular charge. I might say more to Mr. "Justice," but I think what I have said is sufficient to show him that there are other responsible officers on board our merchant steamers for her safety, speed, and comfort of passengers, besides the shipmaster. Thanking you, Mr. Editor, for allowing me this space to give justice to whom justice is due, also thanking you for your able leader in the July number in endeavouring to point out justice.

Yours faithfully,

W. F. OWENS.

### Recent applications for Patents connected with Marine Engineering, Ship Construction, and Mechanical Appliances for use in Ships, from September 16th to October 19th, 1889.

- 14568 G. Blakeley. Cup and ball step masts.
- 14586 W. R. Lake. Signalling by sound (Elisha Harris Howard, U.S.)
- 14607 G. Little and J. J. Stevenson. Stoking boilers.
- 14613 J. H. Bennett. Ships' buffers.
- 14658 F. W. Brewster. Improvements in boats.
- 14698 M. Michelsen. Facilitating nautical calculations.
- 14798 F. S. Pett. Ships' logs.
- 14803 G. Little and J. J. Stevenson. Feeding fuel to marine boilers.

- 14830 E. C. Mills. Regulating and controlling steam engines.  
 14927 B. Willcox. Engines and furnaces.  
 14931 R. W. Allen. Governing marine engines.  
 14935 C. H. Sims and F. Robinson. Automatic lubricators.  
 14966 H. F. Hill. Vessels for navigation.  
 14990 J. R. Wigham. Lighthouses.  
 15002 J. T. Thompson. Ships' rudders.  
 15009 A. H. Walker. Sea-oiling rocket.  
 15034 T. G. Stevens. Steering gear.  
 15041 K. Leverkus. Centrifugal pumps.  
 15134 B. Willcox. Feed pumps.  
 15138 W. G. Stafford. Grapnel for submarine cables.  
 15151 J. Thomson. Indicating water level.  
 15186 M. M. Kelcey. Propelling small boats.  
 15203 R. Goodbody. Separation of incrustation from boiler-plates.  
 15212 M. Vickers. Propelling ships.  
 15223 E. H. Forewood. Mounting and securing spinnaker-booms.  
 15317 R. Crosbie. Ships and other marine vessels.  
 15342 H. J. Payne. Sliding seats.  
 15346 J. W. Kinniburgh. Lowering and securing boats.  
 15373 J. Holm. Indicating the course of ships.  
 15414 T. Whitehead. Ships' ventilators.  
 15417 J. F. Fleat and F. W. Cleveland. Driving cranks of engines.  
 15432 R. Marsden and J. Pickard. Condensers.  
 15444 J. Kirkaldy. Steam engines.  
 15460 J. Hall. Injectors.  
 15473 J. F. Hall and J. Verity. Shafts.  
 15579 C. Wickstead. Tube expanders.  
 15591 J. Llewellyn Roe-Brown and J. Green. Indicating apparatus for ships.  
 15608 C. Wells. Marine steam engine.  
 15642 W. O. Horsnaill. Paddle-wheels and floats.  
 15696 M. F. Neale. Obtaining motive power from the motion of a ship.  
 15702 J. A. Fletcher, S. Fletcher, and J. Fletcher. Injectors.  
 15710 W. Armstrong. Wedge packing for shipbuilding, &c.  
 15730 W. P. Bullivant. Heel attachments of torpedo booms.  
 15776 G. Clarke. Propeller dams for vessels.  
 15802 R. Whitby. Life-buoys.  
 15814 W. Cordts and J. C. A. Plett. Metallic packing for stuffing-boxes.  
 15845 J. Scott. Lubricators for steam engines.  
 15923 J. Love. Collapsible air shaft or trunk for use in refrigerator chambers of ships.  
 15924 E. Hall-Brown. Indicators.  
 15927 T. S. Hosford. Boat-lowering apparatus and detaching gear.  
 15942 J. Scott. Feathering propeller blades.  
 15996 J. R. Pim. Rafts.  
 16032 A. Malta-Muller. Propellers.  
 16056 T. L. Davidson. Boiler tube stopper.  
 16057 A. H. Griffiths. Sight feed lubricators.  
 16062 A. Bell. Mechanical stokers.  
 16075 G. H. Wall. Shields for water gauge tubes.  
 16099 P. Nézeraux. Centrifugal pumps.  
 16114 D. Sisson. Apparatus for removing barnacles and other foreign matter from ships' bottoms.

## BOARD OF TRADE EXAMINATIONS.

NOTE.—1 C, denotes First Class; 2 C, Second Class.

### EXTRA FIRST CLASS.

October 19th, 1889.

Buckwell, G. W. Extra 1C London

Pease, J. C. S... Extra 1C Liverpool

September 21st, 1889.

Adams, S. .... 2C Aberdeen  
 Armitage, W... 1C N.Shields  
 Armstrong, T... 1C London  
 Ayre, T. .... 1C N.Shields  
 Bird, R. R.... 2C Sunderl'd

Black, J. .... 2C Glasgow  
 Blake, G. H. .. 2C Sunderl'd  
 Blyth, W. .... 1C Glasgow  
 Brown, J. .... 2C Sunderl'd  
 Carmichael, F. 1C Glasgow  
 Carter, F. .... 2C Sunderl'd  
 Chapman, A. L. 1C Liverpool

Chilton, W.... 2C Sunderl'd  
 Cowell, J. R. .. 1C London  
 Davies, J. D. .. 2C Bristol  
 Dumont, S.... 1C N.Shields  
 Fairley, J. .... 2C Glasgow  
 Fitzgerald, C.O.B. 1C London  
 Fraser, A. P. B. 2C Liverpool  
 Gilbert, J. T... 2C Sunderl'd  
 Gorton, R. W. 2C Bristol  
 Hall, J. .... 2C Sunderl'd  
 Hamilton, M... 1C Glasgow  
 Hutson, G. E... 2C London  
 Jobson, W. H... 2C  
 McConachy, N. 2C Greenock  
 McGregor, W... 2C Glasgow  
 McKie, J. A. .. 2C  
 McLintock, J... 1C  
 McPhee, D. .... 1C London  
 Marshall, J.... 2C N.Shields  
 Motley, E. L... 2C Liverpool  
 Millar, G. .... 2C  
 Olsson, J. .... 2C N.Shields  
 Pitt, F. .... 2C London  
 Reid, D. .... 2C Glasgow  
 Robertson, O. J. 2C N.Shields  
 Sullivan, C. E. 2C Stmptn.  
 Thompson, R. T. 1C Liverpool  
 Turner, A. .... 2C Sunderl'd  
 Wait, T. H.... 2C N.Shields  
 Watson, A. R... 1C Sunderl'd  
 Whateley, J. J. 2C N.Shields

September 28th, 1889.

Douglass, Saml. 1C N.Shields  
 Frater, Wm. G. 2C London  
 Hubardt, J.... 1C  
 Kirkwood, R. A. 2C Belfast  
 Mayo, Wm.... 1C Cardiff  
 Mills, Arthur .. 2C  
 Mogford, Wm. 2C  
 Moscovik, A. G. 2C London  
 Thomas, Wm. F. 2C Cardiff  
 Toolan, Gavin .. 2C Liverpool  
 Watt, Jas. .... 2C Belfast  
 Watson, Wm... 2C N.Shields  
 Williams, Thos. 2C Cardiff  
 Wiseman, W. L. 2C London

October 5th, 1889.

Anderson, A. W. 2C Glasgow  
 Bain, Wm. .... 2C  
 Ballantine, Wm. 1C  
 Boyd, David .. 2C  
 Brand, Andrew 2C N.Shields  
 Buchanan, D... 2C Liverpool  
 Campbell, Alex. 2C Greenock  
 Cochran, John 1C Glasgow  
 Coomber, Wm. G. 2C London  
 Colquhoun, Chas. 1C Glasgow  
 Davies, W. E... 2C London  
 Dawson, Geo. .. 1C N.Shields  
 Duff, Daniel .. 2C Glasgow  
 Duguid, John M. 2C Greenock  
 Engelbrecht, C. T. 2C Leith  
 Ferguson, Daniel 2C Glasgow  
 Findlay, John .. 1C Leith  
 Forrest, Wm. .. 1C Greenock  
 Gates, Roger .. 1C Liverpool  
 George, Robert 1C London  
 Hall, Chas. .. 2C Glasgow  
 Hall, Robt. Wm. 2C N.Shields  
 Hart, Matthew 1C Greenock  
 Harvey, John W. 1C Glasgow  
 Irving, Wm. .. 2C Leith  
 Jack, Donald .. 1C Dublin  
 Jones, Thos. .. 2C  
 Kidd, W. M. .. 2C Leith  
 Martin, W. G. 2C Hull  
 McAllister, Alex. 1C Glasgow  
 McClymont, Q. 2C Greenock  
 Meiklejohn, Jas. 1C Glasgow

Moncur, Robt. 2C Glasgow  
 Monro, Jas. Scott 2C Leith  
 Morrison, Robt. 2C Glasgow  
 Muir, John .... 1C Greenock  
 Murray, John E. 2C Leith  
 Newton, Fredk. W. 1C Liverpool  
 Patterson, John 1C Dublin  
 Paxton, J. A. .. 2C Leith  
 Prior, F. K. .. 2C  
 Proudfoot, Alex. 2C Glasgow  
 Roberts, John .. 1C Liverpool  
 Roberts, Thos. 1C Leith  
 Slack, John .... 2C Greenock  
 Snowden, A. J. 1C Hull  
 Stevenson, Robt. 2C N.Shields  
 Strachan, Jas. 1C Liverpool  
 Swanson, Geo. 1C Leith  
 Thorp, R. E. .... 1C N.Shields  
 Treasurer, David 2C Leith  
 Venus, Chas. J. 2C N.Shields  
 Wallace, J. R. 1C Glasgow  
 Wallace, Wm. 2C  
 Weston, Geo. .. 1C Liverpool  
 Whyte, Wm. .... 2C Greenock  
 Wilson, Josh. G. 2C Dublin

October 12th, 1889.

Airey, Wm.... 2C W.Hrtp  
 Benson, Henry 1C Liverpool  
 Brown, Joseph 2C N.Shields  
 Campbell, Geo. 2C  
 Cansik, Wm. .. 1C  
 Donaldson, Wm. 2C Dundee  
 Fergusson, Alex. 1C London  
 Forrest, John .. 1C Liverpool  
 Grahame, Geo. 2C N.Shields  
 Griffith, Richd. 2C Bristol  
 Mitchell, Hny. E. 1C London  
 Murdoch, J. J. 1C Liverpool  
 Palmer, Henry J. 1C London  
 Paulsen, V. C. 2C  
 Rich, Thos. A. 2C Liverpool  
 Turner, Wm. .. 2C W.Hrtp  
 Warren, Fredk. W. 1C Dundee  
 Wilkin, Horace 1C N.Shields

October 19th, 1889.

Ablett, H. W... 2C Glasgow  
 Ayrton, A. .... 2C Sunland  
 Back, F. G. .... 1C Cardiff  
 Brodie, Wm. .... 1C Liverpool  
 Bryce, Archibald 2C  
 Butterworth, J. C. 2C  
 Cable, A. S.... 2C Glasgow  
 Clark, James .. 1C Aberdeen  
 Collingwood, A. 2C Cardiff  
 Colverson, Henry 2C Glasgow  
 Douglas, James 2C London  
 Dunn, Robert .. 2C Glasgow  
 Evans, Owen .. 1C Liverpool  
 Fairley, Alex. .. 1C Glasgow  
 Forder, Fredk. 1C London  
 Glen, Peter .... 2C Glasgow  
 Goudie, Andrew 2C  
 Hopkins, Thos. J. 1C Cardiff  
 Kemp, W. Bowman 2C London  
 Ker, Arthur .. 2C  
 Lamont, Thos. W. 1C Glasgow  
 Lang, D. M. J. 2C Cardiff  
 Leaver, John .. 2C  
 McMillan, Daniel 1C Glasgow  
 McRoberts, Thos. 2C  
 North, John C... 1C Liverpool  
 Rule, John .... 1C Glasgow  
 Samuel, James 2C Sunland  
 Service, S. H. .. 2C  
 Sharples, John 1C Liverpool  
 Spiers, Arch .. 2C Glasgow  
 Stewart, J. W. H. 2C  
 Strachan, W. M. 2C London  
 Todd, R. F. .... 1C Glasgow

# The Marine Engineer.

LONDON, DECEMBER 1, 1889.

TECHNICAL education, as supported by the Science and Art Department, seems to flourish, and we are glad to see that it is well supported by well-known practical and scientific men. As an instance, we see that Mr. Robert Caird, shipbuilder, presided at the inauguration of the Greenock Science and Art Class; and in his address mentioned many essential scientific points that have to be borne in mind in connection with the engineering profession, as landmarks by which students, inventors, and practical men ought to steer. Mr. Caird, as a commencement, pointed out the mechanical equivalent of heat determined by professor Joule as 772 foot pounds for each British unit of heat, that is, for one pound of water raised through one degree Fahrenheit. He further pointed out that in our best triple-expansion engines we have only succeeded, up to date, in obtaining one I.H.P. from about  $1\frac{1}{2}$  lbs. of fuel, equal to about 2,565 British units of heat; but the total heat of combustion of  $1\frac{1}{2}$  lbs. of coal is, theoretically, about 18,000 British units of heat; so that, from our best efforts, we but realize about 14 per cent. of the theoretical value of the fuel. Here is an enormous range for inventive talent; of this waste about one-fourth is taken up in causing a draught in the chimney, and never enters the boiler at all, the rest being divided between the furnace, boiler, and engine. As the past fifty years' history of the steam-engine has revealed a series of economies effected in various ways, by which the consumption has been brought down gradually from 4 or 5 lbs. per H.P. per hour to one and a-half, it is surely to be imagined that we have not yet reached a limit to inventive genius, and where the margin is so large upon which we have to work, much greater economies will still be effected. The lecturer then reverted to the principles which guide the construction of a vessel to suitable data, viz., displacement for deadweight of cargo and resistance at a given speed, by which the form of the hull for the necessary displacement, and the H.P. required, is determined. With regard to the general questions of what resistance is chiefly due to, whether to displacement on the one hand, or skin friction on the other, seems yet to be a most disputed point. Every builder has his preference for one method or another, and makes his corrections from his own experience. One of the main obstacles in prosecuting the study of the resistance of vessels lies in the difficulty of obtain-

ing reliable data. Trial trips are rarely conducted on scientific principles with the view to elucidating moot points, or of testing the practicability of theory. When the ship and engine builder has accomplished his guarantee, he is satisfied, and it would be too much to expect him to waste time upon deciding theoretical points for others. Were all trial trips conducted in a certain manner, and with specified tests to deal with theories, we should have a mass of experimental results which could be converted by theorists into definite formulæ.

THE profession of Marine Engineering has received a direct impulse in advance towards placing it on a similar organised and recognised position as that of mechanical and civil engineering, by the establishment of an Institute of Marine Engineers. It must be understood that the Institute of Marine Engineers is in no way connected with the Marine Engineers' Union, a body which has been organised some years ago as a purely trades' union, for the advantage of its members. This form of association is apt to be received with some distrust by employers, as organised chiefly to give definite action to discontent, and dissatisfaction of *employés* as against their employers, and thus almost unavoidably disassociates the sympathies of the two respective classes. The Institute of Marine Engineers, however, has now been organised under the lead of some of the best known and respected Marine Engineers of the day; both among manufacturers and amongst scientific consulting Engineers, the object of the Association being to give a recognised position to Marine Engineers, and to offer opportunities for the meeting of the members of that profession, to interchange their ideas by means of papers and discussions of high scientific and practical value, much, no doubt, to the benefit of the profession at large. There can be little doubt that the sneers as to theory and education that were common a few years ago, both in the Engineers' room and on the quarter-deck, are now things of the past; and it is recognised that even shipowners must naturally derive benefit from the employment of highly trained technical servants. This is the most promising move that we have noticed lately in the Marine Engineering profession in order to raise its members to a proper social standing in comparison with sea-going captains, masters, and other officers of the sister sea-going profession. As we have before stated, we think it extremely probable that the future captain (as steam is now the coming

mode of propulsion) must be either selected from the body of Engineers, or must be required to have some considerable engineering information and training. At present he is almost reduced in actual practice to the position of a navigating officer, allied with long, practical experience of the sea. These requirements are obviously attainable by chief Engineers of long experience at sea, and who would thus be qualified to be chief over both the engineering and navigating departments. The articles of association of this Institute have evidently been drawn up with great care and judgment, and the Council only a few months after its formation is formed of gentlemen well-known in the engineering world. Premises have been taken at Stratford, East London. A technical library has been formed and the means of reading, studying and social recreation have been secured, so as to make it an Institute which promises to be worthy of the heartiest support of the sea-going profession. We cannot repeat too emphatically that the sea-going Engineers who have practical charge of the engines under all circumstances, and during all weathers, are in the best position to see the actual results from various designs, and are thus the most likely to guide and control improvements in marine engine designs; and the more we can induce such sea-going Engineers to recount their experiences amongst their brother professionals in such an accessible and public manner as by reading papers at a public institute, the more we shall see their suggestions and experience aiding the Engineer in those improvements in economy and efficiency which are so important to the carrying trade of the world.

WE are glad to see that the technical education of the rising generation of Engineers, which has long been flourishing in London, Manchester, and Leeds, and other great centres, in connection with the South Kensington and the City and Guilds of London Institute, is being heartily supported in the provincial districts by the large manufacturers. We have been favoured with a copy of a circular issued by the Central Marine Engineering Works (William Gray & Co., Limited), of West Hartlepool, to their apprentices, who seem to number 250. The firm especially draws their attention to the classes that have been lately established in Hartlepool, on Steam Engines, Metal Tools, Mechanical Engineering Machine Construction, Applied Mechanics, Geometry and Mathematics. The employers go so far as to

offer a slight advantage to those apprentices who successfully pass the Government examinations, by offering to refund the class fees to the successful student. It would be well if employers in other districts were to take similar energetic courses in drawing the attention of the rising generation of mechanics to the advantages of adding science to their practical knowledge, and thus impress upon them that success in such studies meets with the decided sympathy and approval of their employers. England has a hard task before her to maintain her Engineering supremacy in the world, nor is our general education in scientific branches as much enforced and impressed upon the youthful generation as in some of the Continental schools. We cannot allow our young Engineers to be beaten in the scientific part of their profession by Continental rivals, and we have no doubt that employers will soon begin to see the advantages that may be reaped to themselves, and the trade at large, by their *employés* being duly qualified to think about, and possibly improve, the mechanical processes and methods of manipulation that pass through their hands.

### THE INSTITUTION OF CIVIL ENGINEERS.

AT the first ordinary meeting of the session, on Tuesday, the 12th of November, the President, Sir John Coode, K.C.M.G., delivered an inaugural address, it being the first occasion of his occupying the chair at an ordinary meeting since his election as President. After referring to the growth of the Institution, from about six hundred when he joined it as a member in 1849, to approximately six thousand at the present time, he alluded to the visit of the American engineering societies soon after the close of the last session, and the leading part taken by the Institution in their reception and entertainment.

When considering the question of a topic for his address, it appeared to him that the experience gained during three lengthened professional visits to distant parts of the British empire might not be unsuitably drawn upon, the visits involving journeyings of more than 75,000 miles. The text of his subject was:—"British Colonies as fields for the employment of the civil engineer." By the term Colony was strictly meant a country, or portion of a country, inhabited by a people who had gone forth from their mother land and had made that country their home, though remaining more or less directly under the government of the country from which they or their ancestors had originally emigrated. These might be said to be British dependencies, held mainly for strategic purposes, in which the British element in the population was very small, such as Gibraltar, Malta, Cyprus and Heligoland; dependencies under the British crown chiefly used as trading-stations, but also serving as coaling stations, and for repairing steamers of the mercantile marine, or ships of the royal navy, such as Singapore and Hong-Kong; Colonies which were exporters of their own produce on a large scale, such as the West India Islands, Mauritius, and Ceylon; and Colonies proper, as Canada, Australia, South Africa, and New Zealand. The key-note to the Colonial question was best represented by the single word "transport." Wherever there was trade, there would of necessity be a demand for the means of transport, and where there was a demand for the means of transport, there would be found a need for the works of the civil engineer. Whilst the population of the world had increased by a little less than 10 per cent.

between 1870 and 1880, the increase in transport within the same period had been fully 53 per cent. The connection was obvious between transport and the several engineering works comprehended under the construction of railways, tramways, roads, canals, harbours, docks, steamships, locomotives, bridges, viaducts, aqueducts, tunnels, waterworks, gasworks, sewage works, and irrigation channels; breakwaters and light-houses might be included within this same category, and he ventured to affirm that this factor of transport pervaded the domain of electric telegraphy. Harbours and docks assumed a special importance in connection with our Colonies. As respected external trade, they formed the terminal links of the great chains of communication which served to bind them to the mother country. As regarded our larger Colonies, the practice had been to extend the roads and railways from the seaports back into the interior, with the result that the land lines of communication parallel to the coast had been as yet but little developed, and much the larger proportion of the traffic between different parts of the same Colony was sea-borne. Hence in most of our Colonies, harbours and navigable rivers assumed greater importance in the matter of transport than was generally assigned to them in the mother country.

Dealing next with the means of reaching the Colonies, the question of oceanic transport by means of steam navigation was of paramount importance. The first crossings of the Atlantic by steam propulsion alone were accomplished by the *Sirius*, of 700 tons, starting from Cork, and the *Great Western*, of 1,340 tons, from Bristol, both reaching New York on the 23rd of April, 1839, the time occupied by the latter vessel having been fifteen days and six hours. It was in this same year that the English Government first invited tenders for the conveyance of mails to the American continent by steam, which led to the establishment of the Cunard Line, of which the first vessel, the *Britannia*, of 1,155 tons and 850 H.P., left Liverpool on the 4th of July, 1840, and took fourteen days to complete the voyage to Halifax. At the present time the passage between Liverpool and New York had been accomplished within six days. The Peninsular and Oriental Co. afforded a striking example of the progress of ocean steam navigation between the United Kingdom and the Colonies. The first contract with the Government for the conveyance of mails by sea-going steamers was entered into in August, 1837, by the company, at that time called the "Peninsular." The steamers ran from Falmouth to Vigo, Oporto, Lisbon, Cadiz, and Gibraltar. In 1840, the company was expanded into the Peninsular and Oriental, and the mails were conveyed by steamer from England to Alexandria; in September, 1842, the service was extended to India; a further contract was undertaken by the company, in 1844, to carry the mails to Ceylon, Singapore, and Hong-Kong; and from March 1852 a service had been established with Australia, and conducted with punctuality, safety, high speed and comfort. Meanwhile the tonnage of the vessels had increased from some 600 to 800 fifty years ago, to 2,500 tons of 2,500 H.P. twenty-five years ago, and to 6,500 tons in the latest additions to the fleet, which maintained a regular sea-going speed of 15 to 16 knots an hour on the 12,000 miles run from London to Australia. This increase of size and power had been specially marked within the last five or six years. One result of recent improvements in steam-ship building was a reduction in the cost of ocean transport. The cost of the freight of heavy goods, such as unmanufactured iron, say to Sydney, a distance of nearly 12,000 miles from England, was about £25 per ton twenty years ago, whereas recently it had been as low as £1 10s. a ton, or a little more than 1-32d. per ton per mile, and the saving in distance by the Suez Canal route as compared with the route by the Cape was only about one-ninth of the whole distance. Sir John Coode then referred to two recent examples of modern passenger steamships—the *Teutonic*, belonging to the White Star Line, 582 ft. in length, with a gross tonnage of 9,685, provided with accommodation for 1,200 passengers, and, by arrangement with the Admiralty, intended to carry in time of war twelve 5-inch guns, having a maximum range of over five miles. The other example was the *City of Paris*, belonging to the Inman and International Steamship Co. This was the only vessel which had hitherto made the passage between New York and Liverpool in less than six days, her mean speed on a voyage in May last having been 23.73 statute miles an hour. This vessel was of 10,500 tons burden and 18,000 H.P., being eight times the tonnage and forty-five times the H.P. of the *Great Western*. She had fifty-four furnaces, and her boiler-tubes exceeded thirteen miles in length. With regard to the possible future

development of steam navigation, the question of hydraulic propulsion by jets of water at a high velocity was engaging the attention of many engineers.

The President then entered into the statistics of the chief engineering works which had been, or were being, carried out in British Colonies, and the scope which existed in those Colonies for the future employment of civil engineers, giving their position, general configuration, and physical features, area and population, climate, industrial products and mineral wealth; and public works, whether executed, in progress, or contemplated in the immediate future. Canada, the largest of the Colonial dependencies of Great Britain, had an area of 3,610,000 square miles, of which 140,000 square miles were covered with water, and the system of inland navigation was the largest in the world. The St. Lawrence alone in conjunction with the great lakes afforded unbroken water communication to Port Arthur and Duluth from Liverpool. The total length of railways in the Dominion was about 14,000 miles, and the area of territory in the Dominion per lineal mile of railway was in the proportion of 258 to 1. Although completed thirty years ago, the Victoria Bridge across the River St. Lawrence still remained one of the finest engineering works of the last half-century; and the Ship Canal in the St. Lawrence, 27½ ft. deep, completed twelve months ago, had a very important bearing upon the commercial prosperity of the Dominion, enabling merchant steamships of the largest class to reach Montreal. Two large graving docks had been constructed, one in Esquimaux, in British Columbia, and the other at Halifax, in Nova Scotia, while a ship railway, 17 miles long, was being laid for the transport of vessels across the isthmus which connected Nova Scotia with New Brunswick. In the West Indies, the harbour of Castries, in St. Lucia, had been selected as the chief coaling station for the British fleet. When finished, the depth of water at low tide alongside the quay would be 27 ft.; the harbour would become of very great importance in the event of the completion of the Panama or Nicaragua Canal. In Europe, Heligoland was the smallest of the British possessions, its area being about ½ square mile, and Gibraltar, Malta and Cyprus within the Mediterranean Sea, were held for strategic purposes only. In Southern Africa there were at the present time only two British Colonies, the "Cape Colony" and "Natal." The Imperial Government has just granted a charter to the British South African Co. to develop the resources of a tract of country four times larger than Great Britain, northward of the Cape Colony, to be called "British Zambesia." The public works of Cape Colony comprised about 1,700 miles of railway, being 1 lineal mile to 12½ square miles of territory; harbours, a breakwater and a graving dock at Table Bay; two iron jetties, together about 1,700 ft. long at Port Elizabeth, in connection with the general railway system of the colony; and a breakwater and training banks at East London. Of the colony of Natal, more than four-fifths of the population were Zulu Kaffirs. The railway mileage was 220 open, equivalent to 1 mile to every 86 square miles of territory. In Ceylon, the most noticeable feature was the growth of the tea industry, which had increased from the insignificant production and export of only 15 lbs. sixteen years ago to 32,500,000 lbs. in 1888. Of railways, which were all owned and worked by the Government, there were 180 miles, or 1 lineal mile of railway for each 137 square miles of country, upon which the net profit had risen to nearly 11 per cent. on the outstanding capital. The Harbour of Colombo, 500 acres in extent, sheltered by a breakwater 4,200 ft. long, was being deepened to 28 ft. and upwards. At Singapore, the capital of the Straits Settlements, a sea-wall 3,000 ft. long was in course of execution, and at Hong Kong, which like Singapore was the emporium of a large trade, a sea-wall rather more than 1½ mile in length, and founded in about 30 feet of water, was about to be constructed parallel to and 250 ft. seaward of the existing wall. An area of about 60 acres would be reclaimed between these walls, whereon high-class buildings would be erected. In New Zealand, 1,750 miles of railway had been completed up to the end of March, 1888, giving 1 lineal mile of railway to 59 square miles of territory. Breakwaters and training banks were being constructed for the improvement of the entrance of the River Buller at Westport, and similar works were in progress at Greymouth. A new graving dock had lately been completed at Auckland, 500 ft. long and 80 ft. wide, with a depth of 33 ft. of water over the sill at spring tides. Otago Harbour entrance had been improved, and a harbour created at Lyttleton, near Christchurch, enclosing an area of about 112 acres, with jetties and wharves having a length of berthage of 11,000 ft., with lines of railways in connection with the general system of the island. The depth of water within the

harbour varied from 19 ft. to 25 ft. at low water. In Tasmania, 440 miles of railway had been opened at the end of 1887, being 1 lineal mile of railway to 55 square miles of country. Sir John Coode then referred to Australia, treating it first as a whole, and afterwards dealing separately with the five colonies into which it was divided. It was about six-sevenths of the size of Canada, and only about one-fifth smaller than the Continent of Europe. An index of its magnitude was to be found in the size of the catchment basin of the River Murray and its tributaries, the area of which was 510,000 square miles, or nearly six times greater than Great Britain. In Western Australia, with a population of only one inhabitant to 25 square miles, there were 450 miles of railway, or 1 lineal mile for each 2,375 square miles of territory. In South Australia, at the end of 1888, there had been constructed 1,820 miles of railway, or 1 mile to 496 square miles of land. At Port Adelaide there was a total wharf frontage of about 13,000 ft., and the channel leading up to the port from the sea had been deepened from 9½ ft. to 22 ft. at low-water. The works for the water-supply of Adelaide were of a very extensive character, and when completed would include a storage reservoir of 2,760,000,000 gallons capacity. Victoria, the smallest Colony in Australia, had 2,200 miles of railway in operation at the end of 1888, being 1 lineal mile to 40 square miles of area. As an instance of the wonderful growth of the City of Melbourne, the capital of the Colony, the President stated that little more than fifty years ago a corner plot of land, near the centre of the city, was sold from a tree stump as a rostrum for £45, and that the same plot with the buildings upon it, had just been valued at £493,500. Until recently, the navigation from the bend of the bay, by the River Yarra-Yarra to the city, a distance of 6½ miles, was through a narrow, tortuous channel. This had been greatly improved by training-works and the cutting of a canal, and the navigation was now through a channel 5½ miles in length, and when completed would have a depth of 20 ft. and bottom width of 150 ft. The storage capacity of the Yan Yean reservoir, for the water-supply of Melbourne, was 6,400,000 gallons, the expenditure on the system had exceeded £2,500,000, and further works were in progress. Irrigation on a large scale had been fostered by the Government of Victoria, the area intended to be irrigated amounting to nearly 1,250,000 acres. In New South Wales, at the end of 1888, 2,160 miles of railway were open, being 1 lineal mile to 144 square miles of country. The length of the great bridge over the Hawkesbury River, which formed the last link in the continuous railway system between the principal cities of the four Colonies of South Australia, Victoria, New South Wales, and Queensland, was 2,900 ft. between the abutments, and the foundations of the several piers, six in number, were carried to depths varying from 101 ft. to 162 ft. below high-water level. The President then referred to the recently-constructed graving-dock on Cockatoo Island, in the Harbour of Sydney, 600 ft. long and 84 ft. wide, to the Macquarie lighthouse at the entrance to Port Jackson, to the water-supply of Sydney, and to the works at Newcastle at the mouth of the Hunter River, the great coal-shipping port of the Colony. In Queensland, the returns up to the end of 1887 showed that 1,770 miles of railway were open, or 1 lineal mile to 378 miles of area. River improvements had been effected in the channel leading up to Brisbane, at the Fitzroy River from the sea up to the town of Rockhampton, at the entrance of the Pioneer River, and also at the entrance to Norman River in the Gulf of Carpentaria. As an instance of the mineral wealth of this Colony, the Mount Morgan Mine, near Rockhampton, was now turning out gold to the value of £128,000 per month, of which £28,000 went in working expenses, and the balance in dividends to the shareholders. The President then observed that the questions naturally arose: Whether the Colonies had been justified in constructing public works? and whether they were capable of bearing the financial obligations they had thereby imposed upon themselves? To those questions, he said, circumstances warranted a reply in the affirmative; taken as a whole, the market value of the public works already executed by the Colonies would be fully equal to their cost. The earlier settlers had in many cases been brought face to face with large and pressing demands, for the execution of such public works as had been absolutely essential for securing ready inter-communication between district and district, more especially between the sea-board and the interior, involving roads, railways, &c., within their own borders, and between themselves and the outer world. Further, in not a few instances, our Colonies had found it absolutely necessary to incur a considerable annual expenditure on sub-

sidies to ocean-going steamships, to insure frequent, regular, and rapid communication with the rest of the world. The question whether our Colonies were capable of bearing their financial burdens could only be answered in general terms; but perhaps the most conclusive reply in the affirmative was to be found in the readiness with which invitations by British Colonies for large loans were met in the "Money Market" of the City of London. It was doubtless not overlooked that in the larger Colonies vast areas of land were yet unappropriated, and formed so much capital in reserve. Moreover, in the case of some of the government lands occupied by squatters, the rentals were subject to a percentage of increase periodically. Further, the financial position, and consequently the spending power of the Colonies was favourably affected by the present low rate of interest obtainable for capital in this country. Many were now able to raise loans at 3½ per cent., who not so very long ago found it necessary to offer 6 per cent. While our own country had for the last three hundred years been steadily building up a great Empire by the acquisition of colonial possessions, it was only within the last decade that any other European State had taken action of importance in the matter of colonization. It was also worthy of remark that within those portions of the world possessing such a climate as to admit of the employment of white labour upon out-door operations, there was not now a single region of any magnitude available for colonization, and that no inconsiderable part of the area of the globe was under the imperial ægis of Britain. In concluding, Sir John Coode spoke of the capabilities and possibilities yet to be developed by the civil engineer, whether in the Colonies or in the mother country. The field was indeed a vast one; great advances had recently been made, and were still being made, in every branch of engineering. Notwithstanding, he would be rash who would venture to prescribe a limit to engineering achievements. He was convinced that as long as the present dispensation might last, so long there would be a continuous progress in the science and practice of every branch of labour in the field appertaining to the civil engineer. Neither to the engineer, nor indeed to any other disciple of natural science, would it seem to have been announced "Thus far shalt thou go, but no farther."

### WATER-TUBE STEAM-BOILERS FOR MARINE ENGINES.

AT the second ordinary meeting of the Institution of Civil Engineers on Tuesday, the 19th November, the President, Sir John Coode, K.C.M.G., being in the chair, the Paper read was on "Water-tube Steam-boilers for Marine Engines," by Mr. John I. Thornycroft, M. Inst. C.E. Water-tube boilers were those in which the water to be evaporated was contained within the tubes which formed the heating-surface. In 1878, Mr. Flannery, in a paper contributed to the Institution, showed what progress had been made up to that date with this kind of boiler at sea. That communication and the discussion which followed, proved that although considerable saving of fuel had been obtained with them, water-tube boilers as then made were unsuitable, because the tubes forming the heating-surface were burnt, owing to insufficient circulation. The author, therefore, commenced by discussing the kinds of circulation in various forms of tubulous boilers, arriving at the conclusion that circulation, in order to be perfect, must be systematic, under which condition a smaller amount of water could be successfully used and the weight of this element thereby reduced. By circulation, he intended to convey the idea of motion of the water contained in a steam generator, from the upper surface of the liquid down to the lower part of the generator, and returning again to the upper surface. Motion of water, simply from the point where the feed-water was admitted to a point in the boiler where it became steam, he wished to hold distinct from the idea of circulation. Having thus defined the term, the author divided all boilers into classes, depending on the manner in which circulation took place. The first type dealt with was described as the oldest and simplest form of boiler, in which circulation at the outset depended upon small variations of density in its different parts. The action might be energetic when boiling took place, but was wanting in order, being struggling and confused in character, and nowhere acquiring high velocity. The circulation of the earliest water-tube boilers was of this nature. The author then described the boilers of Mr. Perkins, Mr.

Herreshoff, Mr. du Temple, and of Mr. Matheson; also giving an account of the Field tube. The boilers of the *Peace* and of the *Propontis* were compared, and the most suitable diameter and length of tube were discussed. The author attributed the failure of the upper ends of the tubes of the *Propontis* to their being of such large diameter, that instead of steam and water passing over in foam, steam alone left the tubes, and that all impurities brought in with the feed-water gradually accumulated in the upper part of the tubes, and ultimately led to their destruction. He thought it possible that obstruction from sediment collected in this manner gave rise, at a later period, to the more serious failure of the large water-chambers. He next showed that a water-tube boiler might be constructed of less material than one of the ordinary form, and that this result was partly due to the fact that a strong envelope only was required to surround the steam and water, which must necessarily be enclosed in a pressure-resisting shell. In the case of the ordinary form of boiler, there was a strong vessel containing not only the steam and water, but likewise the fire and the products of combustion. These latter, it was pointed out, were again enveloped in a second or inner shell, and thus were covered twice by material to resist the whole pressure contained in the boiler. This was shown to be one evident cause of the great saving of material possible with the water-tube system. The reduction in weight was accompanied by greatly superior steaming-power, economy of fuel and less forcing of the fires. Lastly, the safety of the vessel and crew had been materially increased. The conditions favourable to perfect combustion, and those which tended to satisfactory absorption of the heat from gases produced, were then described, together with a boiler which the author had designed with a view to embody the principles of circulation and of combustion which appeared to him to be the best. Lightness of structure and strength to resist internal pressure had been particularly kept in view, and the evil effects of unequal expansion had been provided for by the curved form of the tubes, which afforded practically the whole heating-surface. These tubes were shaped so as to make an arch over the fire, only allowing escape for the products of combustion by a series of narrow openings a little above the surface of the fire. In the upper portion of the arch each tube, by touching its neighbour, formed a continuous roof, and enclosed a large space above the fire-bars, extending the whole length of the boiler. The tubes which composed the firebox, having arrived at a point near the centre of the arch, altered their direction of curvature, and after meeting, turned apart again to give room for the largest vessel in the boiler. By keeping in contiguous lines they afforded a protection from the heat to this vessel. In a similar way in which the furnace was formed, two rows of tubes united to make the external casing of the boiler, at the same time constituting a flue in which numerous other tubes were placed. The ends of all these tubes were secured in three horizontal cylinders, two of which served the purpose of supplying water to the tubes. The third was a separator, from which the steam produced was taken and the overflowing water returned to the tubes. For this purpose large external tubes connected the separator to the cylinders forming the base, and between these cylinders the firebars were arranged with a fire-brick bridge on either side, protecting the cylinders from excessive heat. The fire-doors were situated at one end of the tunnel or arch of tubes, and the other end was closed principally by blocks of light fire-resisting brick inclined away from the fire to add to their durability. The water-level in the boiler was best a little below the centre line of the separator, in which was placed, underneath the points where the tubes entered, a shield to guide the circulating water down to the water-surface, at the same time protecting from spray a perforated pipe, in which the steam was collected. The ends of the boiler were covered with plating, and in order to make the casing quite smoke-tight the outer wall of tubes was also covered with light plating, but this had not to resist any great heat. The first watertube boiler, put into a torpedo-boat by the author's firm, afforded a very satisfactory means of comparison between the new boiler and its locomotive rival which had been placed in a sister vessel. The result of steaming was eminently satisfactory, and the saving in fuel at equal speeds was sufficiently evident without exact experiment, the boat under natural draught being about 1 knot an hour faster than the other vessel, the full-power trials showing also a difference of 0.67 knot speed in favour of the former. Some evaporative trials were made by the Portsmouth authorities, and the results seemed to indicate that equal duty could be obtained when the propor-

tionate quantity of water evaporated was 2.86 from the watertube boiler to 1.00 from the locomotive boiler. After this boiler had been at work for three years, several tubes were cut out with the view to ascertain their state. They afforded a sample of tubes under varying conditions. Some were taken from the fire-box where they had been exposed to the full intensity of the heat, and some from positions in the flue where the heat was much less. Their condition was eminently satisfactory. The small amount of scale in their interior was a great contrast to the condition of water-tubes taken from the boiler of the *Propontis*, in which the circulation was not so well provided for; the thickness of the tubes had suffered no perceptible diminution. The author then gave the results of some recent trials made by Professor Alex. Kennedy—whose report was appended to the paper—both at natural draught and with different amounts of forced draught, and a full description was given of the method of conducting them. At the most economical rate of working, the evaporation, reduced to standard, amounted to 18.4 lbs. of water per lb. of fuel, and the following heat-balance showed the way in which the heat of combustion was utilized by the boiler:—

	Per cent.
Heat expended in heating and evaporating feed-water	86.8
Heat expended in raising temperature of furnace gases	10.8
Heat lost through formation of carbonic oxide	0.5
Heat lost by radiation and otherwise unaccounted for	1.9
	100.0

The very high percentage of evaporation, 86.8, represented the efficiency of the boiler, and was simply equal to the ratio between the actual evaporation and that theoretically due to the perfect combustion of the fuel, or  $\frac{18.4}{21.1}$ . Professor Kennedy stated that it was the highest boiler efficiency he had found upon any trial, and he believed the highest on record in any trustworthy manner.

## INSTITUTE OF MARINE ENGINEERS.

A MEETING of the "Institute of Marine Engineers" was held in the Langthorne Rooms, Stratford, on Friday evening, November 1st, when the first general business meeting of the Institute was held, presided over by Mr. A. Beldam. The HONORARY SECRETARY made the following statement:—

Mr. Chairman and Gentlemen:—

It is with a considerable degree of pleasure that I ask you to look back with me over the past nine months and trace the footsteps of the Institute of Marine Engineers from the early tottering of childhood to the firm tread of youth. I would also ask you to allow your minds to soar beyond the limits prescribed by time present, gaze hopefully into the future, and behold the Institute in the full force and power of its perennial manhood.

In February of the current year we may say the Institute was founded, when the first public meeting was called in order to feel our way and test the feeling of engineers on the subject.

The reading-room was opened about the same time, and the table supplied by voluntary contributions. The loan collection was then added as a library of useful and pleasant books for the use of members, and has been added to month by month, until now the necessity has arisen for an additional case to contain the volumes.

The collection of objects of interest and specimens is also gradually increasing, and many samples and specimens are being held back for want of accommodation. The seven papers which have been read are now matters of history, and the comments of the press are such that I need not further refer to them, except to express the hope that the papers in preparation may sustain the character earned by their predecessors. I am pleased to note that the attendance at the reading of papers has been steadily increasing.

The Recreation Committee are now at work arranging for a social meeting or conversation to be held in the Town Hall, Stratford, on December 6th, for members and their personal friends. The registration of the Institute was completed in July, when Mr. Neely received the charter from the Board of Trade and forwarded the same to us. The names of the Council and office-bearers are printed in the copies of By-Laws and Articles of Association, which may be inspected by members in the reading-room, and in view of the election to take place at the annual meeting in March, members should

examine the list with a view to the election of the new Council. Voting lists and notices will be posted in due course in terms of the articles in the By-laws. The membership to this date is as follows:—160 members, 8 honorary members, 9 associate members, 9 associates, 4 graduates, total 190: with the addition of several applications, which yet remain to be considered, the total will reach 200. The receipts up to this date amount to £321 5s., the expenditure to £201 17s. 4d., leaving a balance of £119 7s. 8d. (There is still a balance of account to be paid to Mr. Neely of about £40). In connection with this cash statement it may be remarked that there are several annual subscriptions due from members who have up to this date only paid their entrance fees, and I may take this opportunity of asking members to bear this in mind. It should also be remarked that the legal expenses in connection with the registration of the Institute has cost, including what remains to be paid, about £100. Mr. Neely, of 25, Old Jewry, who acted as our solicitor in the matter, has our warmest thanks for the manner in which he conducted the negotiations, and the personal interest and trouble he took, and in addition for his preferred and courteous offer to act as honorary legal adviser to the Institute. It rests with the members, after what has been done by the present Council and office-bearers, to express their views as to the style in which the business has been conducted, and if they are satisfied that the honour and dignity of the Institute is safe in their hands till the annual meeting, to move a vote of confidence accordingly. The annual meeting takes place in March; this is merely a formal business meeting, called in accordance with the requirements of law, to give members an opportunity of expressing their satisfaction or otherwise with the office-bearers and what they have done. It is highly gratifying to observe that so many of the leading journals and scientific papers are desirous of reporting our proceedings and have expressed opinions favourable to the Institute. We would thank the various editors and proprietors for their courtesy and kindly interest, as well as for their good wishes. It is not many months since at our third or fourth council meeting, when the question arose regarding notices from the press, I remarked that the time would come when in place of our seeking to obtain notice from the press, the press would seek to obtain notices from us. My remark was prophetic, the time I predicted has come, and the spirit of independence which animated me to make the remark has been justified in the sequel. It is more in keeping with our life work as engineers to prove what we are and demand success by results achieved than to seek by adventitious means to gain that to which we have not proved our title. In closing, I would seek to act the prophet again, we—I speak as the mouth-piece of the present council—have established the Institute on a good sound basis, some of us have not spared ourselves in seeking to command that success should crown our efforts, and it remains with every member of every grade to do his utmost to advance the highest interest of the Institute; doing so, I venture to predict a great future for the Institute, and through it, the whole trade to which we esteem it an honour to belong.

The CHAIRMAN commented upon the work which had been done since the 12th February, when the inaugural meeting was held, and asked for an expression of opinion from members.

Mr. SAGE proposed, and Mr. J. W. DIMMOCK seconded, the motion of a cordial vote of confidence in the present Executive of the Institute. This, on being put to the meeting, was carried unanimously.

Mr. LESLIE, convener, reported that a committee of ladies is working along with the Recreation Committee in arranging for a conversazione in the Town Hall, Stratford, on the 6th December. The programme is well in hand, and the meeting promises to be a most pleasant one.

The business meeting closed with a vote of thanks to the President, Mr. Beldam.

On the same evening the PRESIDENT read a paper on the "Progress and Development of the Marine Engine." Mr. J. McF. Gray occupied the chair, and introduced the author of the paper with a few appropriate words, when Mr. BELDAM proceeded to give a *resumé* of the history of the marine engine from the first engine designed by Symington, and fitted in a small vessel to ply on the Forth and Clyde Canal, to the latest powerful and magnificent steamers of the Inman International Line. In the discussion which ensued, some very valuable and interesting information was elicited. Mr. Wymer referred to crossing the Bay of Biscay, in the days of his boyhood, in the *William Fawcett*, in 1834, and related his experiences with the early types of marine engines, the difficulties which had to be contended

against, and the great troubles and discomforts endured by those who had charge of them. The experiences and reminiscences of their youth detailed with freshness and vividness by Messrs. F. W. Wymer, J. McF. Gray and others of the older members, were exceedingly interesting, and to hear these gentlemen was to partake of a mental feast of a nature such as we have seldom enjoyed. The work of the Napier, Elder, J. Scott Russell, Caird, Kirk, Bryce Douglas and other celebrated engineers, was referred to, also the immense importance of that work in the economy of the universe. The discussion was kept up with much interest, many members taking part in it with evident relish and enjoyment. The whole proceedings were of a most interesting character. Mr. Beldam replied to the several points which had been raised in the course of the evening, and the meeting closed with the usual vote of thanks to the author of the paper and the Chairman.

The Honorary Secretary announced that the first conversazione in connection with the Institute was arranged to take place in the Stratford Town Hall, on the 6th December, tickets for which could be obtained through members.

## MARINE ENGINE GOVERNORS.

A MEETING of the Institute of Marine Engineers was held in the Langthorne Rooms, Stratford, on Monday evening, November 18th, presided over by Mr. J. McFarlane Gray, when a paper on "Marine Engine Governors and the Benefits derived from their Use" was read by Mr. J. D. Churchill.

The Chairman introduced the author of the paper as an engineer who had not only devoted a good deal of attention to the subject of governors, but had given a practical illustration to show that he had not spent his time in vain. In the paper it was pointed out that as a rule the governor was looked upon as merely an assistance in heavy weather when the engines are racing, due to the pitching motion of the ship, whereas in the opinion of the writer it ought to be considered an integral portion of the machinery, and always kept at work. It was legally binding on railway companies to fit brakes on trains, and on steamship owners to fit safety valves on the boilers, so also should it be imperative to fit governors on the engines. If a thoroughly efficient governor were to be fitted on every marine engine, and engineers brought to see the usefulness of, and the additional safeguard derived from such, the percentage of losses due to machinery breakdowns at sea would be materially lessened. Cases were cited where shafts had broken suddenly, causing an excess of damage due to the engines running away at an abnormal speed, whereas had a governor been in use, this would have been prevented. Many steamers were lost on account of a portion of the machinery giving way and resulting in a general disablement of the vessel. Steamers were posted as "missing," and ultimately as "lost," without a record to show what had happened; doubtless not a few of these were lost in the same way as those referred to, as being disabled for want of a governor or brake to check the engines, when, say a propeller shaft had given way and the portion coupled to the engine, revolving at great speed without being automatically checked, had broken through the stern tube and ship, leaving a passage for the sea to enter and swamp the ship, unless stopped by the prompt closing of the water-tight bulkhead door. Although the three-crank engine is better balanced and is considered less in need of a governor than the two-crank engine, it stands really in the same position so far as the real service is concerned. Some data were given showing the number of breakdowns and the immediate causes of them, and Mr. Churchill drew conclusions from the information he had tabulated as evidencing the great desirability of having a governor connected to every marine engine, not merely for the purpose of preventing racing due to heavy weather, but always connected and always at work, so that it was attached to the vital principle ready for any emergency foreseen or otherwise.

The discussion which ensued elicited considerable expression of opinion, the general tone of the speakers showed that the leading argument advanced by Mr. Churchill was sustained, and we do not doubt that those engineers who were present would look upon the governor as a machinery detail of much greater importance in the outfit of the engine-room than they had formerly. The discussion was maintained by Messrs. Richardson, Shorey, Coubro', Adamson, Rowe, Scobie, Craig, Wilson, Blair, Thomson, Brett, and A. W. Robertson.

The Chairman gave some valuable hints in the course of the evening, and at the special request of several speakers desired Mr. Churchill to give a brief description of his own governor, the merits of which had been referred to by a few of the speakers who had sailed with it. After the closing remarks and reference to the principle on which the Churchill governor is based, the proceedings terminated with the usual vote of thanks to the author of the paper and the chairman, moved and seconded by Messrs. Rowe and Craig and Messrs. Coubro' and R. Adam respectively.

### SOUTH WALES SHIPBUILDING.

ON October 26th the largest ship ever built at Cardiff was successfully launched from the works of the Bute Shipbuilding, Engineering, and Dry Dock Co., on the east bank of the River Taff. It was intended that the ship, which has been named the *Cardiff Castle*, should be named by Lady Bute, but in her absence through unforeseen circumstances the ceremony was performed by Lady Lewis, who was accompanied by Sir William Thomas Lewis. The *Cardiff Castle* has been built for Messrs. Morel Brothers & Co., and is 265 ft. long by 26 ft. beam, and 21 ft. 6 in. hold. She has been constructed on the long bridge and quarter-deck principle, with steel of excellent quality, manufactured at the Dowlais Works. Her deadweight is 2,750 tons. She was specially designed by Mr. Thomas Dobson, manager of the Bute Shipbuilding Works, and has a large capacity for stowage. She will be fitted with triple-expansion engines of 200 H.P., and her probable speed will be 9 knots an hour, with a very small consumption of coal. Brown's patent furnaces will be used, and the ship will have all the modern improvements suited to that class of vessel. The construction of the boat has been superintended by Captain Phalp, assisted by Mr. Rennie, and the engines will be put into her under the supervision of Mr. Farrant Good, M.I.N.A. She will be supplied with a number of winches and a steam windlass for the expeditious discharge of cargo. She will be ready for sea in about three weeks. The *Cardiff Castle* is the eighth craft which has been launched from the Bute Shipbuilding Yard, and the nearest to her in size was the *Collivaud*, which had a deadweight of 2,000 tons.

After the launch the invited guests sat down to an excellent breakfast at the offices of the Bute Shipbuilding Co.

Captain POMEROY, at the close of the repast, gave the toast of "Success to the *Cardiff Castle* and Messrs. Morel Brothers," which was received with much enthusiasm. He remarked that they were all pleased and proud that morning to witness the launch of such a fine vessel as the *Cardiff Castle*. Every twelve months they had a hardy annual in the shape of one of these events, but he hoped it would soon be of monthly and weekly occurrence. Messrs. Morel Brothers deserve the hearty appreciation of the public for their spirit and enterprise, for it was no secret that the boat which had been launched that day could not be laid down now at the same price by many thousands. He hoped the *Cardiff Castle* would have good freights and plenty of them.

Mr. THOMAS MOREL, who responded in the temporary absence of his brother, the chairman of the company, stated that the early hour in which they had met would prevent him from dealing with many subjects. As to the shipbuilding of Cardiff, it was a matter in which he had taken very great interest. Captain Pomeroy had alluded to a monthly ship launch. Perhaps Captain Pomeroy was in the secret, but, as a matter of fact, one of the questions that had arisen lately had been as to the number of ships they could lay down at the same time. The reply of the manager was "Ten," which was not far from the monthly number. He hoped to see the time when such a number would be building together, and that would not be very long. There was no reason why the Cardiff shipwrights should go to the North for their ships. The steel of which the *Cardiff Castle* had been built was manufactured not far away, and had been delivered more cheaply in their yard than steel manufactured in the North was delivered in the Tyne, Wear, and Tees yards. The difference in price he believed at the moment was 25s. per ton. As to the wages question, he was not going to introduce debateable matter, but referring to what had been stated lately as to the Workmen's Union, he was glad to see that the signatories for the men had placed Cardiff on the same standard as the Tyne and Clyde. Consequently, with very slight difference in detail, they had been able to build

their ships at the same wages as would have been paid were they constructed in the North. This matter had never been properly understood. Cardiff wages for shipbuilding corresponded exactly with the standard of the Northern ports. Having the steel close at hand, and the men able and willing to work at these rates, there was no reason why they should not have all Cardiff ships built at their own doors. Ships built in Cardiff with steel from the Dowlais Works compared favourably with, and, indeed, were far superior to, the ships built in the North. A gentleman from the Midlands had told him that he could not use the scrap iron of which ships were built in the North for forging purposes, owing to its bad quality. The scrap iron from their Cardiff works could be used for any such purpose, and their ships were better than any of the Clyde or Tyne. He considered, therefore, that they ought to obtain a higher class at Lloyd's.

There is now on the stocks at the same yard a steamship, to be called the *Mayfield*, of 3,900 tons deadweight, which is being built for Messrs. Wood, Bright, and Tylor, London, under the superintendence of Captain Fleming. It is expected that she will be launched at the end of this year or beginning of next.

### MARINE BOILERS.

AT a meeting of the members of the North-East Coast Institution of Engineers and Shipbuilders, held at Sunderland, on November 8th, a paper was read on "The Strength of Boilers," by Mr. James C. Spence, M.I.N.A., the paper being illustrated by various plates. He said that for many years the opinion had been gaining ground among engineers that the rules at present in force prescribed a greater thickness for the shells of marine boilers than practical experience showed to be necessary. The engineers of Her Majesty's Navy, acting on this experience, had recently made great reductions in the thickness of the shells without making any corresponding reduction in the thickness of other parts of their boilers, and Mr. A. C. Kirk, speaking at last year's annual meeting of the Institute of Naval Architects, said that if the designers of boilers for the Mercantile Marine were their own masters, and not subject to official control, they would long since have altered their practice in the same direction. The object of his paper was to bring to their notice a new method of calculating the strains on boilers, which, if correct, would allow them to make enormous reductions in the thickness of marine boiler shells without making any reduction in their factor of safety or any radical change in their designs. An examination of the present theory on the subject, and a reference to one or two elementary principles, would put in a clear light the difference between the proposed theory and that now in use. Mr. Spence concluded his paper with a short summary of the arguments used therein. After noting that practical experience had led many engineers to the conclusion that the rules now in force prescribed an excessive thickness for the shell plates of marine boilers, he examined the theory on which these rules are based, and found that it was a theory only true for open-ended rings, which might be approximately true for long boilers; but for short boilers of the marine type it was manifestly untrue. He then considered the case of a very short boiler, and saw that in such a case the strength of the shell, instead of being the sole consideration, was a small fraction that might be neglected, and the whole strength of boiler to resist rupture might be reckoned as that of the end plates. He then showed that the distribution of strain on a given section did not depend on the form of the vessel of which the section was a part, but only on its area and pressure. From this he inferred that in two boilers of which the length of the one equalled the diameter of the other, as these would have a rectangular section equal in all respects to each other, the strain at any point in this rectangle would be precisely the same for both boilers. He then estimated the difference of thickness of shell plates prescribed by old and by new method, and found in three typical proportions of boilers that—in one case the old rules required a thickness half greater than new theory; in another the old rules required a thickness twice as thick as new theory; in a third the old rules required a thickness three times as thick. He then noted that if the new theory were correct, then their old theory had led them to commit, at least, two other serious errors. And, finally, by an appeal to the best and most recent experiments on the strength of a boiler, he found that these experiments were inconsistent with the old theory, and agreed with great exactness with the new one. The discussion on the paper was adjourned.

## LAUNCH OF THE CRUISER "BLAKE."

ON Saturday, Nov. 23rd, before Lord G. Hamilton and the Lords of the Admiralty, the *Blake* was successfully launched from Chatham Dockyard. Among those present were Lady G. Hamilton, Admiral Hotham, Sir William Graham (Director of the Naval College), Admiral Fairfax, Mr. W. H. White (Assistant Controller of the Navy), Sir Walter Kerr, Sir J. C. Colomb, M.P., Lord Brassey, Admiral Lethbridge, Admiral Kelly, General Dunne, Deane Hall, and Mr. C. T. Glenn (Chief Constructor).

After the service appointed to be used at the launching of her Majesty's ships had been read, the ceremony of christening the vessel was performed by Lady George Hamilton, who carried a large bouquet of white flowers presented to her on entering the dockyard. Similar flowers, arranged by Miss Glenn, decorated the stem of the vessel and concealed the bottle of wine used in the christening. Lady G. Hamilton then with a silver chisel cut through a few strands of rope; the dog-shores fell, and without the least hitch, the vessel slipped rapidly and smoothly from the slips to the river, amid the cheers of the many hundreds of people who had assembled to witness the launch.

The *Blake* is the largest and most heavily-armed vessel yet laid down for this kind of service in any navy, and is intended to surpass all rivals in speed and coal supply, while her protection is of an exceptional character.

The *Blake*, and her sister ship the *Blenheim*, now under construction by the Thames Iron Works, at Blackwall, were the first cruisers of large size ordered by the present Board of Admiralty. They have been designed by Mr. W. H. White (Assistant Controller and Director of Naval Construction), and have been very rapidly advanced since they were laid down last year. Preparations for building the *Blake* began early in the financial year 1888-9, and the work was fairly taken in hand about sixteen months ago. The condition in which the vessel will be seen now that she is launched is good evidence that the officers and men of Chatham Dockyard have had their heart in the work. Much remains to be done, of course, in the installation of the propelling apparatus, the completion of the internal fittings, the erection of the armament, and the general equipment. But so far as external appearance is concerned, the *Blake* at launching gives a much better idea than most warships do of her appearance when completed; and she will be free from most of those eccentricities of form which are familiar in so-called battleships wherein fighting capability overrides considerations of graceful appearance. The *Blake* is a fighting machine, no doubt; but she is also shipshape above as well as under water.

She is the largest ship that has been built for the Royal Navy during the last 25 or 30 years. No such vessel has been added to our fleet since the days of the *Warrior* and *Minotaur* classes. Between perpendiculars she is 375 ft. long, and over all not much less than 400 ft. Her extreme breadth is 65 ft., and her displacement (or total weight) fully laden is to be 9,000 tons. There is a curious similarity in length and displacement to our first sea-going ironclads, the *Warrior* and *Black Prince*; but in all other respects there is a marked contrast.

The hull of the *Blake* is constructed of steel, on the cellular system commonly adopted in her Majesty's ships. There is no novelty of principle in the structural arrangements, which have, however, been very carefully worked out in order to meet the strains consequent upon her great length and heavy armament. Minute subdivision of the hold space by watertight bulkheads and decks, a cellular double bottom, and an exceedingly strong and watertight steel protective deck guarantee the maintenance of buoyancy to the ship even if she were very seriously damaged by grounding or by an enemy's attack.

The system of protection is also very similar to that followed in preceding vessels, certain differences of detail having been introduced which are permissible in such large vessels, while unsuited to smaller ones. From stem to stern the hold is roofed over, as it were, by a curved steel deck, supported by deep girder beams. The edges of this deck amidships are 6½ ft. below water; the top of the deck rises about 1½ ft. above water. On the slopes of the deck over machinery and boilers the protective steel is 6 in. thick; on the horizontal portions it is 8 in. thick. Below its protection are placed propelling machinery, steering gear, magazines, shell rooms, and all that vitally styled the vitals of a warship. This protection is in that of any foreign cruisers with similar decks;

and it compares favourably with the deck protection in the large Italian battleships, which are 50 or 60 per cent. greater in displacement.

The *Blake* is not to be protected by vertical armour on the sides, in which respect she resembles most of the cruisers recently built or building. In the number and calibres of her guns the *Blake* will resemble the *Orlando* class. She is to carry two 9.2 in. 24-ton guns, 10 6 in. 5-ton guns, and 18 smaller quick-firing guns. The 6 in. guns are intended ultimately to be quick-firers, their weight, with ammunition, being equivalent to that of 20.6 in. service guns of the pattern now afloat, and they will fire much more rapidly. The 24-ton guns will be carried on the upper deck, as bow and stern chasers, with large horizontal arcs of command. Six of the 6 in. guns are to be carried on the upper deck, two being capable of firing right ahead as well as on the broadside, two firing right astern, as well as on the broadside, and the midship pair training from 60 deg. before to 60 deg. abaft the beam. Four of the 6 in. guns are to be carried on the main deck, two on each broadside. Consequently, five 6 in. guns and two 9.2 in. guns will be available on each broadside, one 9.2 in. and two 6 in. will fire right ahead, and the fire right astern will be identical in character. In addition to the guns, the *Blake* will carry a powerful torpedo armament, including both above water and submerged tubes. Her bow will be strengthened for ramming.

She will be propelled by twin-screws, driven by four sets of triple-expansion engines of the inverted vertical cylinder type. Messrs. Maudslay and Field are the makers of these engines and boilers. The collective power they guarantee is 13,000 H.P. for 12 hours' steaming at natural draught and 20,000 H.P. for four hours' with forced draught; the corresponding maximum speeds are estimated at 20 knots for natural draught and 22 knots for forced draught, when the vessel is run in smooth water with everything at its best. On actual service, judging from past experience, with ordinary conditions of coal and stoking, the engines may be expected to develop about 9,000 to 10,000 H.P. for long periods of continuous steaming, which would probably give the vessel a continuous speed of 18 to 18½ knots in smooth water. Her greater length and weight will insure superiority over all other war cruisers in the maintenance of speed at sea; and she should also possess greater steadiness as a gun-platform in consequence of her larger dimensions.

## LARGE SAILING SHIPS.

THERE has been quite a number of large sailing ships built on the West Coast this year; some of them of very large dimensions.

At Whitehaven in the early part of the year was launched the four-masted ship *Windermere*, of 2,893 tons gross. This ship was built to the order of Messrs. Fisher & Sprott, of London. Again, on June 29th, was attempted to be launched the four-masted sailing ship *Alice A. Leigh*, which unfortunately stuck in leaving the ways, but was with the aid of several tugs towed off a few days after. This ship was built for Messrs. John Joyce & Co., Liverpool, and is of the following dimensions:—Length between perpendiculars, 301 ft.; breadth, moulded, 45 ft. 11 in.; depth of hold, 25 ft. 2½ in.; tonnage, 3,003 gross, 2,929 net; deadweight capacity about 4,397 tons. This is the largest ship ever built at Whitehaven. On the 5th of October was completed the launch of the four-masted ship *Engelhorn*, which had also stuck on the ways. This ship is 319 ft. long, 42½ broad, and 24 ft. 4 in. in depth, and was built for the firm of Messrs. De Waly & Sons, Liverpool. These three ships were all built at Whitehaven by the Whitehaven Shipbuilding Co.

At Liverpool, on the 13th July, was launched from the yard of Messrs. W. H. Patten & Sons, the four-masted ship *Falkland*, for Messrs. Macvicar, Marshall & Co., Liverpool, and is of the following dimensions:—Length, 317 ft.; breadth, 45 ft.; depth of hold 25 ft.; tonnage, 2,804 gross; 2,739 net. This is the largest sailing ship ever built at Liverpool. She was launched by Mrs. Reid, and on leaving the ways was named the *Falkland* by Miss Collins.

About the same date was launched from the yard of Messrs. T. Royden & Son, Liverpool, the four-masted sailing ship *Hollinwood*, also for the firm of Messrs. Macvicar, Marshall & Co., and is of 2,673 tons gross, 2,606 net; and in length 307 ft., 45 ft. in breadth, and 24 ft. depth of hold. She is fitted with all the latest improvements, including Harfield's patent windlass and Clarke, Chapman & Parson's steam winches.

## LAUNCH OF A GREEK BATTLESHIP.

ON October 26th, the second of a series of three new and powerful Greek battleships was launched and was named the *Spezia*, in the presence of M. and Madame Deliyannis and the ex-King Milan, at the yard of the Société des Forges et Chantiers de la Méditerranée, at Graviile, near Havre. The *Spezia* was designed by the French Admiral L. J. Lejeune, chief of the French Naval Mission in Greece, assisted by M. M. Dupont, the engineer, and she is a steel, ram-bowed, completely belted vessel of 4,885 tons displacement, measuring 234 ft. in length, 51 ft. 10 in. in breadth, and 29 ft. 8 in. in depth. Her mean draught of water is 18 ft. The hull, which is divided into 116 water-tight compartments, is protected at the water-line by a belt of Le Creusot steel of 11·8 in. in *maximum* thickness. This tapers down to 4·72 in. Below the belt is a complete protective deck, composed of three thicknesses of ·49 in. steel plates, making 1·97 in. in all. The armour above the belt has a thickness of 2·95 in., and is intended chiefly to afford defence against the explosion of shells. All this armour is supplied by the firm of Châtillon et Commentry. Behind it is a cellular cofferdam, and behind this again are the coal-bunkers. Higher up there is a casemate, nearly rectangular in shape, armoured with plates 13·7 in. thick, and abaft there is a barbette, protected with 11·8 in. plates of Creusot steel. There are twin screws, driven by horizontal triple-expansion engines, which, developing 6,700 indicated H.P. under forced draught, are to drive the ship at an extreme speed of 17 knots; but the speed for continuous steaming at sea will be about two knots less. The armament of the *Spezia*, which, it should be recollected, is, after all, less in size than the far slower and feeblere British battleship *Rupert*, is an extraordinarily powerful one. The heavy guns are all on the Canet system, and have been built at Havre, where, also, their mountings have been constructed. On the top of the armoured casemate, in the forward part of the ship, are two barbettes, one on each side. In each of these is a 27 cm. (10·6 in.) B.L., 36 calibres in length, throwing a projectile weighing 551 lb., with an initial velocity of 2,197 ft. per second, and capable of piercing 29 in. of iron at the muzzle, or 22 in. at a distance of 2,200 yards. In the armoured barbettes aft there is a similar gun of 30 calibres in length. In each of the four corners of the casemate there is a 15 cm. (5·91 in.) B.L., of 36 calibres, and above it, between the forward barbettes, there is another gun of the same kind. Each of these weapons, with a charge of 42 lb. of powder, throws a projectile weighing about 92 lbs., with an initial velocity of 2,296 ft. per second, and can pierce nearly 12 in. of iron at the muzzle, or 8 in. at 2,000 yards. The auxiliary armament, which is not on the Canet system, comprises seven 57 mm. (2·24 in.) 6-pounder quick-firing guns, and sixteen 37 mm. (1·46 in.) 1-pounder Hotchkiss "canons-revolvers." There are, in addition, five launching tubes for Whitehead torpedoes.

In order to fully realise the extraordinary offensive power of this remarkable little battleship of 4,885 tons, one has only to compare the number of her guns and the weight of metal which they are capable of simultaneously throwing with the number of guns and the weight of metal of a few ironclad battleships belonging to other Powers. Leaving the auxiliary armament out of the question, the *Spezia*, with her eight heavy guns, can throw, at one discharge, 2,113 lbs. of projectiles. Below is a comparison which is very suggestive:—

Date of Ship.	Name and Nationality.	Tons.	Number of Heavy Guns.	Weight of one Discharge.
1889....	Spezia (Gr.) .. ..	4,885	8	2,113 lb.
1872....	Rupert (Br.) .. ..	5,440	4	1,012 lb.
1885....	Hero (Br.) .. ..	6,200	6	1,828 lb.
Building	Texas (U.S.) .. ..	6,300	8	2,100 lb.
1885....	Aquidaban (Braz.) ..	5,000	8	1,880 lb.
1882....	Vauban (Fr.) .. ..	5,780	11	1,805 lb.
1878....	Preussen (Ger.) ..	6,660	6	1,884 lb.

And, in addition, the *Spezia's* guns are, weight for weight, far more powerful than the guns of any of the other vessels named. They are built for use with the newest powders, and they give very high initial velocities and abnormal penetration. As for the *Spezia's* auxiliary armament it is formidable in the extreme. Each of the 6-pounder quick-firing guns can be easily fired 12 times a minute. They could, therefore, together throw 82 projectiles, weighing in all 492 lb. within the short space of 60 seconds. The "canons-revolvers" can throw 40 projectiles a

minute, and there are 16 of them. Thus, an enemy in boats attacking the new Greek ironclad might find himself exposed from quick-firing and revolving guns alone to a hail of projectiles falling about him at the rate of over 700 a minute.

## THE "CLARKE-DOWSEN" BALLAST, BILGE OR OIL PUMP.

TO everyone connected with steamships, the Ballast or Bilge-pump is more or less familiar. The superintending engineer and those under him are but too well aware of the trouble and annoyance of the choking of pump-valves. Perhaps the greatest wonder about the matter is, that this unsatisfactory state of matters has been allowed to continue for so many years. The cause, however, is not difficult to find. It has not been for lack of novel inventions in steam-pumps, professing to cure some or all evils with which ships' engine-room pumps have been so long afflicted, but from the perfectly justifiable aversion on the part of users to put into a steamship any machine which might possibly get disarranged and be difficult to understand or repair.

For a shipowner the "Clarke-Dowsen" ballast-pump means a practical immunity from the cost of repairs.

To the superintending and sea-going engineer it affords absolute reliability of action and a minimum of attention combined with extreme simplicity.

Before proceeding to describe the construction of these pumps, it may be desirable to state some of their special features:—

They have fewer working parts than any other pump.

They occupy less space than any other pump of equal power.

They start from any position having no dead centre.

They will pump oil, water carrying wood, chips, coal, grain, cotton waste, &c., which would choke an ordinary pump.

They have neither steam nor water-valves.

If taken adrift they cannot be put together again wrongly, and any mechanic can dismantle and re-erect them readily.

They will work down to a very low steam pressure. This is specially serviceable in draining out ballast or oil tanks.

They cannot damage themselves by over-running or suddenly losing the suction water.

They will pump water at a temperature of 212°; two have been recently supplied to Her Majesty's Navy for pumping very hot drain water.

They are noiseless. The steam distribution in these pumps is obtained in a very simple and effective manner. Each piston is composed of two junk rings, with a gun metal Ramsbottom ring in each, and between these two junk rings a wide spring packing ring is fitted. In this wide ring cavities are formed, which by means of a suitable arrangement of steam and exhaust parts in the cylinders enables each piston to act as an ordinary steam and exhaust slide valve for admitting and releasing the steam which works the piston in the other cylinder.

Consequently, there is a positive reciprocal action obtained between the pistons of the two steam cylinders; and as the steam admission port of one or the other piston is always open to the steam inlet, the pump will start from any position of the pistons with the utmost certainty.

Care has also been taken to so balance the piston rings that not only are they absolutely steam tight, but by this balancing they remain so much longer than any usual piston and slide valve arrangement could be expected to do, and this under the highest steam pressures. Further, these balanced pistons work with the least possible loss of power by friction.

To obtain a simple but effective and automatic steam cushion to take up the momentum of the piston at each end of the stroke, a separate passage is used for the exhaust exits from the ends of each cylinder, and the piston, before quite completing its stroke, closes this and imprisons part of the exhaust steam to form a cushion. This simple method answers perfectly.

The water or pump end is arranged on very similar lines to the steam cylinders, each plunger, in addition to being a double-acting ram, is so arranged as to serve as suction and delivery valve to its neighbour, a continuous suction and delivery being thus maintained by a positive mechanical action quite free from the troubles that beset the best arrangement of buckets, plungers, and valves in the ordinary pump.

The ballast or bilge pumps have very large water passages, which, with the peculiar suction and delivery action of the two plungers working reciprocally to each other, not only allow the pump to work with the least possible friction, but also render the

pumps unchokable, by any of the many materials which so frequently paralyze the action of valve pumps.

The importance of this feature cannot be over-estimated, for there is scarcely a single marine engineer who has not experienced serious trouble from his bilge pump valves constantly becoming choked in rough weather when chips of wood, rain, lumps of grease, and other obstructive matter are being washed about the engine-room bilges.

The water cylinders of all these ballast, bilge, or oil, pumps are lined with a specially durable brass, and the plungers, rods, and glands are all of hard and tough gun metal.

These pumps are specially suitable for pumping out oil cargoes, and are giving very great satisfaction in this line.

No other pumps of similar capacity could be got into the same pump-rooms as those already fitted and about to be fitted in oil vessels.

Every pump before being sent out is carefully and severely tested under precisely similar conditions of work to those for which it is ordered, and as there are usually two or three pumps at work in the testing-house at the Victoria Works, anyone interested in the invention can see one at work on paying a visit there.

After being tested and passed the pump is then taken adrift plainly marked for re-erecting, well oiled out, and finally put together for despatch.

Messrs. Clarke, Chapman & Co. have turned out over 50 of these Clarke-Dowson ballast and bilge pumps during the past two-and-a-half years and have received most satisfactory reports from the users. It may also be stated that several repeat orders are now in hand.

### ENGLISH SHIPBUILDING AT BILBAO.

WHEN the Spanish naval authorities, some two years ago, invited British shipbuilding and engineering firms to submit offers for the construction of cruisers to strengthen their fleet, they made the important stipulation that while British capital and superintendence might be utilised, the work was to be executed in Spain and by native artisans, with the exception of about a fourth of the number, who might be English workmen. This desire to foster native industries had the effect of considerably reducing the number of firms tendering for the work. Sir Charles M. Palmer, however, in conjunction with Mr. Martinez-Rivas, who had ironworks at Bilbao, offered to comply with the conditions, and they were successful in securing orders for three first-class cruisers of 7,000 tons displacement. An establishment had to be formed. The site chosen was formerly a desert on the west bank of the River Nervion, at a point where the river takes a slight bend. The ground has been reclaimed, and in less than a year a fully-equipped shipbuilding and engineering establishment has been laid out and started. The works include shipyard, engine works, gun factory, graving and wet docks, and all the requisite departments for producing warships. The proximity of Martinez-Rivas's iron works, too, affords splendid facility for the delivery of material. The managers of the departments are men of considerable experience. Mr. John P. Wilson is manager of the shipbuilding-yard, and Mr. James McKechnie is manager of the engineering works. Both gentlemen were associated for many years with Messrs. James and George Thomson's noted establishment at Clydebank. The works are on a most extensive scale, and they have been equipped in a most complete and careful manner. The rapidity with which they have progressed is all the more remarkable when it is borne in mind that the labour employed has been almost wholly Spanish.

There are now three cruisers in various stages of construction. The contract for these was signed early in June last, and the first vessel is framed to the armour belt, and for the second the frames are under way, while the keel of the third is being laid. The first vessel is to be delivered complete in two years, the second six months later, and the third in three years. The cruisers, generally speaking, are of the same type as the Australia class in the British Navy, but they are considerably larger in every respect, their displacement being 1,400 tons more, length, 64 feet greater. The machinery is more powerful by nearly 4,000 indicated horse-power, and the maximum speed  $1\frac{1}{2}$  knots per hour faster. The engines are to be of the triple-expansion type, driving twin screws, and are to develop 13,000 indicated horse-power—the vessels a speed of 20 knots per hour.

### LAUNCH OF AN AUSTRALIAN WARSHIP.

ON Monday afternoon, November 25th, the Australian cruiser *Pelorus*, built for the Australian Squadron, was launched from the Elswick Shipyard, Newcastle-on-Tyne, amid considerable enthusiasm. The ceremony was performed by Lady Samuel, wife of Sir Saul Samuel, Agent-General for New South Wales, in the presence of a large assembly, amongst whom were Sir Saul Samuel, Captain Noble, Mr. Watt, Canon Lintott, Canon Franklin, the Mayoress of Newcastle (Mrs. Bell), Lady Browne, and others.

The cruiser *Pelorus* is 265 ft. between perpendiculars, her extreme breadth is 41 ft., her mean draught is 15 ft. 6 in., and her displacement 2,575 tons. She will be fitted with twin-screw, triple-expansion machinery of the aggregate power with forced draught of about 7,500 horses (indicated), and with natural draught of about 4,500 I.H.P. The estimated speed of the vessel with forced draught is 19 knots, and with natural draught 17 knots. She will carry 300 tons of coal, which will enable her to steam about 6,000 knots at 10 knots speed. Her armament will consist of eight 12-centimetre rapid-firing guns, eight 3-pounder rapid-firing guns, one 7-pounder boat and field gun, two Nordenfeldts, and four torpedo guns. The machinery and all the vital parts of the ship will be protected by means of an armoured deck, which will rise a little above the water-line for the greater part of the vessel's length, but whose sides will slope down to some 4 ft. below the water-line. The horizontal portions of this deck are 1 in. thick, and the sloping portions  $2\frac{1}{2}$  in. and 2 in. thick. The deck is raised some 2 ft. in the neighbourhood of the engine-room, so as to afford space and protection to the tops of the cylinders, which extend above the water-line, and at the extremities of the vessel the deck falls below the water-line and is reduced in thickness three-quarters of an inch. The vessel is provided with a strong conning tower, which stands on the forecastle, fitted with engine-steering gear, engine-room telegraphs, torpedo and gun director's voice pipes to all parts of the stays, and all other apparatus necessary for working and fighting the ship in action. The *Pelorus* is the third vessel of the class launched for the Australian Government; one, named the *Pandora*, was launched from the Elswick yard on August 28th, and one from the Clyde since that date. There are two more vessels of the class to be launched, one of which is in course of construction at Elswick, and the other on the Clyde.

It is understood that the Admiralty have entered into contracts for the construction of the four new armour-clad battle-ships of 14,000 tons each. The firms entrusted with this work are Messrs. Palmer & Co., of Newcastle, who are to build two ships; Messrs. J. & G. Thompson, of Glasgow, who are to construct one vessel; and Messrs. Laird Brothers, of Birkenhead, who have also to build one ship.

### PAMPHLETT-FERGUSON PATENT FRESH WATER DISTILLER.

AS promised in our last number, we now give an illustration, and detailed description, of this new distiller:—

Our illustration will explain its principal parts—A. The evaporating chamber, in the lower part of which high-pressure steam from the boiler surrounds a nest of vertical tubes, about 2 in. diameter. The upper part (which is the only portion visible) forms a steam-chest and separator combined, so that any water in the steam is thrown down by two inclined baffle-plates or driven outside as the steam travels round the circular passage on its way to the pipe that leads to the condenser B.

A difficulty which causes much trouble in all evaporators, and especially in one in which the pressure varies from 0 to 15 in. of mercury on the vacuum gauge, is to keep the water automatically at a constant level. This is effected by a float in the chamber C so proportioned that on board ship the rolling would have little or no effect on it. To this is attached a small double beat valve that admits, through the pipe *d*, the warm circulating water that leaves the condenser at D, and keeps the water in the evaporator at a constant level without requiring any attention. As on the reliability of this automatic feed the regularity in the

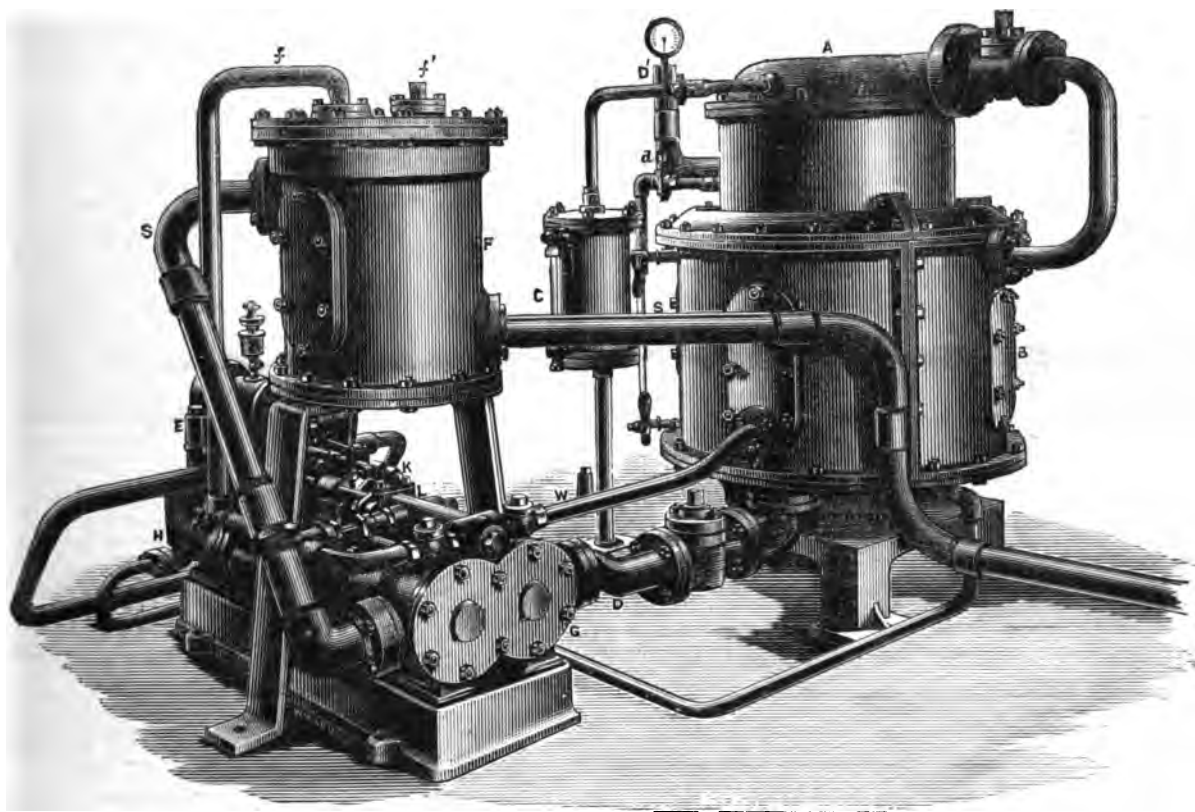
working of the condenser largely depends, particular care is given to its construction, and every facility is afforded for easy inspection. The condenser B is of annular form, and contains about 120 tubes  $\frac{1}{2}$  in. diameter and 20 in. long, of the ordinary Admiralty pattern. They are expanded into the tube-plates, this being found quite sufficient to make a perfect joint that will stand under all conditions of ordinary work. The circulating water that enters at the bottom of the condenser, and *leaves* at the top at D', flows through the tubes, the steam from the evaporator condensing outside, so that if any incrustation is formed it will be on the inside of the tubes, whence it may be easily removed by a tube-cleaner.

The steam-pump E was specially designed to meet the requirements of this distiller, and consists of—firstly, the circulating pump G, a feature in which is its simplicity, there being no suction or delivery-valves. There are two gun-metal cylinders connected at one end by a passage, the two pistons are driven direct from the cross-head, and each is fitted with merely an indiarubber

side and around the tubes in which the fresh water passes. SS is the suction-pipe.

The advantages of this distilling apparatus are as follows:—It is not likely to get out of order as it is not complicated in its construction, and is easily cleaned. All the deposits taking place in short vertical tubes of large diameter, the contraction and expansion of which causes the scale to fall to the bottom, from whence it can be removed, through a mudhole, which is always accessible.

The greatest of all troubles, viz., the leakage of salt water into the fresh, ought, with a competent engineer, never to take place in this apparatus, as the only joints through which this could happen are the tubes in the condenser, and these can be tested by hydraulic pressure before erection, and a leak can be detected at once (if it occurs at all). The only parts that are likely to want renewal are the tubes in the evaporator or condenser, a repair to which any engine-room artificer would think nothing of executing. Besides these, there are half-a-dozen ordinary mush-



circular valve. By this means a double-acting pump is obtained that gives a perfectly even flow of water, and the parts likely to get out of order are reduced to a minimum. Secondly, a brine-pump H to pump the brine out of the evaporator. Thirdly, a condensed high-pressure steam-pump for pumping the condensed steam from the boiler out of the evaporator either to the hot well direct to make up the boiler feed, or through the filter to be cooled and aerated for drinking purposes. Fourthly, a double-acting pump for pumping the fresh water from the condenser B through the filter and cooler F, and also for forcing air into the water to render it fit for drinking. The steam cylinder is of usual type, the valves being actuated by tappets, and all the above pumps are worked from one cross-head.

The filter and cooler F contains vertical tubes which are filled with the filtering medium, i.e., charcoal, and through which the condensed fresh water passes, going down one set and up the others, entering hot at *f*, and leaving at the same temperature as the circulating water at *f'*. The cooling is done by the water on its way to the suction inlet of the circulating-pump passing out-

room valves, which could not only be repaired, but wholly remade without largely taxing the resources of any sea-going engineer. The small size and number of these parts likely to wear renders it a very simple matter always to have a spare set at hand, and the fact that all joints of any importance to the efficiency of the apparatus can be tested by hydraulic pressure before erection renders the employment of spare gear perfectly simple and easy, and even if no spare gear is provided, the tubes being of standard sizes, can be readily procured everywhere. Another great trouble with most evaporators is the before-mentioned depositions of solid matter from the water that is being evaporated. The low temperature at which this is carried on in the Pamphlett-Ferguson evaporator, not only reduces the amount of solid matter deposited from sea or hard water, &c., to a very small proportion, but what is unavoidably deposited is done so either in the form of mud, or as a soft scale, which, if not removed by the action of the tubes, as explained, can be done easily by means of ordinary tube-cleaners. In most apparatus this cleaning of the tubes of the evaporator entails the loss of

the services of the whole apparatus while it is being effected, but here a spare evaporator, of very small dimensions (say 12 in. in diameter by about 20 in. long) affords a means by which this very serious trouble is entirely obviated. It being possible to replace the one in use by a spare one in about half an hour or so. Another point of the greatest importance in the production of fresh drinking water, is to prevent the intolerably nauseous and empyreumatic taste and odour which it generally possesses. This is partly owing to its want of aeration, which is due to the fact that water, when heated, begins at 130° to give up the oxygen, carbonic acid, nitrogen, &c., which all natural waters hold in solution. It is perfectly futile to try, as so many inventors of distilling apparatus do, to induce the water to redissolve these gases while it is at a temperature far above that at which it begins to give them off, and even in some cases while in a state of steam. Here the air is pumped along with the water, through the filter and cooler, and the cold water in the cooler receives under pressure more air than it is capable of retaining after it comes out, so that it not only retains its proper amount of air, but an excess which imparts to it all the characteristics of spring water. The empyreumatic taste and odour is chiefly due to the substance known as "glue," which all sea water contains, and, as it has been well described, consists of "the animal remains of countless generations of marine life," and besides this substance nearly all waters (but especially sea water) contain immense numbers of animalcules, as recent bacteriological researches have shown.

These low organisms are composed principally of a substance called proteini, and none of them are able to exist in water hotter than about 140 degrees Fahrenheit, and the fact of some of them being able to withstand this heat shows that the proteini is not decomposed until above this temperature. Practically about 200 degrees may be said to be the temperature, long subjection to which breaks up the proteini, and causes the nauseous taste to which we referred. This, like the deposit of hard scale, is also entirely obviated by the low temperature of evaporation. Besides the animal matters, which are not able to stand prolonged high temperature, there are many mineral substances, to prevent the decomposition of which the water holding them in solution must not be raised to a high temperature, or kept at it for any

length of time. Amongst these the commonest that may be mentioned is chloride of magnesia, which on decomposing forms chlorine gas, this passes over with the steam and converts the distilled water into a weak solution of hydrochloric acid. To this cause may be attributed, very probably, much of the decay and eating away of the plates of marine boilers, which has for many years given endless trouble and anxiety to all connected with them. But the low temperature of the evaporation, and the small capacity of the evaporator, entirely obviates this most serious mischief. A distiller placed on board ship must be able to perform its offices perfectly and continuously, and not only supply good drinking water, but the distilled water for boiler feed make-up ought to comply with the requirements that the scientific knowledge of the present day demands. We have just seen how the drinking water delivered by the Pamphlett-Ferguson Patent Condenser is prevented from being contaminated with either animal remains or mineral acids or gases. But recent investigations have pointed out that the water for boiler feed make-up should contain no air, as nothing causes the oxidation of the boiler plates so quickly as the presence of air in the boiler, and considering the high temperature to which the oxygen in this air is raised in modern boilers, this is not surprising, therefore, unlike the methods now in vogue, especial care has been taken that the distilled water as it leaves the condenser shall be pure and entirely free from air.

This is effected by delivering at a temperature higher than that at which all the air is expelled from the water, and it is thus unable to absorb any of the gases that may come over from the evaporator; it is therefore pumped direct, perfectly free from air, and at a temperature of about 160° to the boiler-feed tanks, thus fulfilling all the conditions demanded by modern engineers in replenishing the unavoidable loss of water in boilers working at those high pressures, which alone renders triple or quadruple-expansion engines practically possible, or, if preferred, the steam from the evaporator can be taken direct to the condenser. The high-pressure boiler steam that is used in the evaporator is returned to the feed-tanks at a temperature that need not be much less than 212°. To show how the heat from the steam is entirely absorbed in doing useful work we append the following results of trials carried out by Mr. G. H. Wailes, A.M.I.C.E.:-

No.	Duration.	Steam Pressure.	Temperature of Steam.	Weight of Steam condensed.	Temperature of Condensed Steam.	Temperature of Feed Water.	Boiling point in Evaporator.	Weight of Distilled Water.	Weight of Brine.	Temperature of Brine.	Units of Heat absorbed from Boiler Steam.	Units of Heat absorbed in Distilling.	Units of Heat in Brine.	Loss of Heat by Cooling.
1	50 mins.	35 lbs.	281° F.	378 lbs.	202.1°	101.3	203°	333 lbs.	302 lbs.	185.4°	389,151	357,442	25,307	11
2	1 hour.	25 lbs.	267.3°	309 lbs.	205°	99°	204°	260 lbs.	185 lbs.	180°	315,767	280,021	14,985	6
3	50 mins.	39 lbs.	287.1	415 lbs.	212°	118.4°	193°	372 lbs.	182 lbs.	189.5°	410,642	392,311	12,940	11
4	45 mins.	39.8 lbs.	288°	392 lbs.	210.5°	84°	195°	336 lbs.	90 lbs.	178°	376,124	364,560	8,460	1
5	50 mins.	40 lbs.	288.4°	415 lbs.	210°	118°	195°	372 lbs.	95 lbs.	190°	398,815	390,972	6,840	1
6	30 mins.	40.5 lbs.	287.5°	236 lbs.	212°	181.6°	212°	231 lbs.	50 lbs.	210.6°	233,522	230,168	1,450	1
7	30 mins.	36.5 lbs.	283°	260 lbs.	212°	106°	200°	236 lbs.	65 lbs.	180°	256,880	252,039	4,810	0
8	30 mins.	40 lbs.	287.5	275 lbs.	212°	130°	198°	255 lbs.	52 lbs.	182°	272,110	266,220	2,704	11

These trials have been carried out, not only with a machine on a practical working scale, but also for periods which carry them beyond the range of experiments. In all these trials it was not necessary to pay any attention to the adjustment of the valves, &c., of the apparatus, as once adjusted they work the whole time automatically and without needing the slightest attention. We

may, therefore, say that the apparatus fulfils perfectly all the conditions that are required by the progress made of late years in marine engineering and shipbuilding, viz., supplying, economically, pure drinking water, cold and aerated, and entirely devoid of any flat or insipid taste, and pronounced by all persons who have tasted it to be equal to the purest

spring water, and, at the same time, supplying water for boiler-feed make-up at a high temperature and entirely devoid of air, acid, or any other deleterious substance.

"In accordance with instructions I have made a series of trials of this apparatus, and the following is my report:—

"I will first state that I have gauged the efficiency of the apparatus simply by the quantity of water evaporated as compared with the quantity of live steam used at such a temperature as gives the best results; this, in truth, is the only standard by which the capability of an evaporator of this description can be measured. Such comparisons as are often made of the water distilled and the coal consumed are misleading, as the efficiency of the boiler supplying the live steam and the quality of the fuel must then be taken into account, questions entirely foreign to the efficiency of the evaporator.

"Having examined the apparatus while being worked by the makers, I made myself acquainted with the general construction and management, and afterwards, having seen it partly to pieces, determined on the nature of the tests to which I proposed to put the apparatus, keeping in view the claims of the specification and the special features on which those claims are based, as well as the purposes to which the inventors consider it most applicable. These latter are more especially for distilling fresh water from sea-water for:—1st, Replenishing the loss in boilers at sea; and 2ndly, For drinking and other uses on board ship, &c. Since, in the first case the hotter the feed-water the better, I intended to work the apparatus with as little unnecessary loss of heat as possible, and made trial of the apparatus with that object. The result of the trial was that 5.3 lbs. of distilled water at an average temperature 168°, and 5.7 lbs. condensed steam at boiling point, were obtained, giving for boiler-feed a total averaging 1.1 gallon a minute at a temperature of about 190°.

"The second series of trials was to evaporate and distil water for drinking and other purposes. After making several trials, each time varying the steam pressure and vacuum, I finally made two long trials at a steady pressure, averaging 35 lbs., and vacuum of 6 inches, during which the apparatus worked without a hitch, and the samples of water I took and sealed for analysis, if required, appeared to be very pure. *I could not detect any indication of priming, and think that by working at this pressure and vacuum no fear of priming need be entertained.* As I was able to make very full notes of these trials I am in a position to compare the efficiency of the evaporator with what would be obtainable in a theoretically perfect evaporator, i.e., in one where there was no loss by radiation and other causes, and which would give a return of cent. per cent. of the heat expended. I find the average to be within 6 per cent. of the maximum effect possible in theory with a single evaporator. I find the quantity of distilled water per minute to average .61 of a gallon, with an expenditure of .75 of a gallon of condensed steam.

"MAXWELL WILLIAMS."

Since Mr. Williams made this report, the efficiency of the apparatus has been much increased by Mr. G. H. Wailes. It will be observed that about 10 per cent. of the total heat is used in warming the feed-water to the boiling point in the evaporator, in order to preserve a vacuum. The pumps had to be run at a high speed, and this considerably reduced the temperature at which the circulating water left the condenser and entered the evaporator. A part of the tubes in the condenser, where the steam enters, are now isolated, and the feed-water only passes through them, thus the temperature of the feed remains constant and higher than that of the circulating water. From the table prepared by Mr. Wailes the advantage of this will be seen in the case where the pumps were run too slowly to create a vacuum, and the feed-water entered at 181.6°. This has now been remedied, and the feed-water is heated, while the pumps run at a high speed.

A 50-gallon apparatus, as now remodelled, for use on board-ship, occupies a deck space of 3 ft. 7 in. by 4 ft. 5 in. by 4 ft. 5 in. high.

We may mention that in the foregoing table an allowance of 32 units per lb of boiler steam has been made, experiments having shown that the moisture in the steam from the boiler, &c., rendered this necessary to obtain accurate results.

## EDINBURGH ELECTRICAL EXHIBITION, 1890.

THE "first sod" of the site for the Edinburgh International

Exhibition, 1890, was cut and turned over with becoming ceremony by Lady Clark, wife of Sir Thomas Clark, Bart., chairman of Executive Council, on the 23rd November, and matters, doubtless, will now proceed with regularity and precision till the opening of the great show in May of next year. The Exhibition, as is now well known, will be devoted to electrical engineering and to general industries. Plans have been prepared of the necessary buildings, and of the laying out of grounds, &c. Two main buildings are comprised in the design as accepted, one of which will be devoted to general exhibits, while the other will embrace machinery and electrical appliances. The former has a *façade* of 700 ft. in length, and extends laterally 200 ft., while the latter will be of the same length by 150 ft. in width. The block generally will partake largely of the French Renaissance character of design, while a Moorish feeling will be introduced in the towers, corner, domes, and minarets, which surmount the main structure. The machinery hall will occupy a floor space of about 100,000 superficial feet. Here will be exhibited machinery in motion, and all manner of electrical and general mechanical inventions. The grounds will be tastefully laid out, and provided with a great variety of attractions. The main entrance to the Exhibition will be from the terminus of a tramway line, but both the Caledonian and North British Railways will have stations within the grounds.

In connection with the Exhibition a company has been formed for the purpose of laying down and working a flexible car ship-railway, suggested no doubt by the success attending the switch-back railway, which has been so popular in recent Exhibitions, but possibly due in some measure to the serious interest with which ship-railways are now coming to be regarded in this country. The feasibility of this scheme is much favoured by the presence of the Union Canal in the grounds of the Exhibition. The ship-railway line, which is to be 1,200 ft. in length, is to rise gradually out of the bed of the canal at a point near the main entrance to the Exhibition, and to traverse by curves and gradients the margin of an enclosed field, and to return to the bed of the canal by a similar gradient as the initial one at a point near one of the railway stations already referred to. The railway proper will consist of two parallel lines, each of 20-inch gauge. It is proposed to run four launches, boats, or gondolas, 30 ft. long by 2 ft. draft capable of containing thirty persons in each. A hundred and twenty passengers will thus be accommodated simultaneously, the round trip by land and water occupying ten minutes, including the time on the initial and final inclines and at the railway station.

THE NEW THIRD-CLASS CRUISER "BARROSA," laid down at Portsmouth in May last year, and which was, according to the estimates, to have been completed in September, completed the trials of her machinery by the Palmer Shipbuilding Company, Jarro, at Portsmouth, on Saturday, November 23rd. The conditions of the trial were four hours' continuous full-power steaming under forced draught. Since her last abortive run under like conditions the grate surface in each of her eight furnaces has been lengthened 16 inches, and the exhaust ports of her low-pressure cylinders have been enlarged. The draught of the vessel was 12ft. 9in. forward and 15ft. 2in. aft, giving a mean immersion of 13ft. 10½in. In all respects the trial was highly satisfactory. In fact, both in power and speed the performances were in excess of the estimates. The mean pressure of steam in the boilers was 151.2lb., the valves being arranged to blow off at 155lb.; the vacuum in the condensers was 25.4in. and 25.6in., and in the auxiliary condenser 10in.; the revolutions 200 starboard and 201.4 port; and the power developed 1,522 by the starboard and 1,588 by the port engine. This gave a collective indicated horse-power of 3,110, or 110 horses beyond the contract, the greatest power developed during any half-hour being 3,225. The stoking was easily carried out, and as the air pressure in the stokeholds was restricted to 2in., while the average pressure was only 1.39in., a higher result might have been obtained had it been deemed expedient to press the boilers. The speed on the measured mile was 16.868 knots. The steering machinery was also tested, when it was found that the helm was moved from hard-a-starboard to hard-a-port, and *vice-versa*, in 30 sec. by eight turns of the wheel.

## THE QUADRUPLE-EXPANSION ENGINES OF THE S.S. "BUENOS AIRES" (BROCK'S PATENT.)

**A**MONGST the most interesting models of marine engines at the Paris Exhibition, was that of Mr. Walter Brock's patent quadruple-expansion engines, as fitted in the steamship *Buenos Aires*, built by Messrs. William Denny & Co., Dumbarton, for the *Compania Transatlantica*.

Before proceeding to describe the special features of the type of quadruple-expansion engines, it will be useful to enumerate the sizes of the principal parts. The diameters of the cylinders are as follows:—High pressure 32 in., high intermediate  $46\frac{1}{2}$  in., low intermediate  $64\frac{1}{2}$  in., low pressure 92 in., the uniform length of stroke being 60 in. The working pressure of steam is 180 lbs. per square inch, and the aggregate I.H.P. 4,300. The pumps have each a stroke of 24 in., and are as follows:—Two single-acting vertical air pumps 26 in. diam., and two double-acting vertical circulating pumps  $14\frac{1}{2}$  in. diam., worked by links and levers from the main-cross heads. There are also two feed and two bilge pumps, the former with brass, and the latter with cast-iron plungers  $5\frac{1}{2}$  in. diam., and also a steward's pump 6 in. diam., and 12 in. stroke on the back of the condenser driven by the pump lever. Our illustrations show the complete engine, but it will be unnecessary to describe it in complete detail, as, with the exception of the cylinders, valves and connections, the design and arrangements are identical with those of the ordinary compound engines. The main feature of this type of engine, patented by Mr. Walter Brock, is the adoption of four cylinders, in each of which the steam is successively expanded, and by this means is obtained the increased economy due to the use of higher pressure of steam, than can be efficiently utilized in the triple-expansion engine.

Another important feature, observable at a glance, is the adoption of tandem cylinders, which enables the four cylinders to be combined, and to require only two cranks to transmit the power, thus saving the multiplication of working parts involved in the three-crank triple-expansion engine.

The manner in which the tandem cylinders are arranged constitutes an important departure upon ordinary practice. As is well known, there are not a few tandem compound marine engines in existence, and although in most instances fairly successful, yet they have been attended with considerable drawbacks; notably the double-stuffing boxes required between the cylinders for the piston-rods; and the difficulty of obtaining access to the lower cylinders for examination or repair, without removing the upper ones, a matter of considerable difficulty, involving the disconnecting of valve gear, steam pipes, and other connections.

From our illustrations, pp. 368 & 369 it will be noticed that the upper cylinders have no valves or pipe connections fixed to them. The distributing valves for all the cylinders are in casings attached to the lower

number of stuffing boxes is the same as for an ordinary compound engine, the usual upper tail rod and ag boxes of such engines being in this instance

represented by the metallic packing for the piston-rods between the two cylinders.

Owing to the upper cylinders being unencumbered by valve boxes and pipe connections, they can be lifted from their place with almost as much facility as ordinary cylinder covers. This is, however, seldom necessary, as doors are fitted in the top or cover of the lower cylinders, by which access is obtained to their interior, except when the cylinders are too small, when they become unnecessary, the cylinders being readily lifted. Two doors opposite each other are also formed in the bottoms of each of the upper cylinders, by which easy access is obtained for examining or overhauling the metallic packing rings of the piston-rods.

The pistons are of cast steel of a conical form, and of a single thickness of metal. The apices of the cones of the pistons of the upper and lower cylinders are turned outwards towards each other, and the ends of the cylinders being made to fit, sufficient space is thus obtained between the cylinders for the doors described above, without adding to the total height of the engine. This is shown on the cross section through each pair of cylinders.

The upper cylinders have piston valves, and the lower cylinders double-ported flat valves of the ordinary kind; the piston and the slide valves for each pair of cylinders being contained in the same casing. The high pressure and high intermediate cylinders have one piston and one slide valve mounted on the same cylinder, while the low intermediate and low pressure cylinders have two pistons and two slide valves, the separate valve spindles being united by a crosshead underneath the stuffing boxes. The piston valves are withdrawn when required by removing the covers provided on the top of the casings. The lower valves are arranged so as to slip off their spindles without the latter requiring to be disconnected, and are withdrawn with great facility when required by doors provided at one side for the high intermediate pressure cylinder, and at both sides for the low pressure cylinder, as will be seen on reference to our illustrations.

The upper piston of each piston valve is made larger in diameter than the lower, by which means, as the entering steam is between the pistons, the weight of all the valves and gear is balanced, or as much as may be desired.

A brief description of the course of the steam through this engine may be of interest. The steam from the boiler enters the engine by a pipe or passage formed between the two pistons of the high pressure cylinder valve, from whence it is distributed in the usual way to passages leading to the top and bottom of that cylinder. The only portions of the engines thus exposed to the full boiler pressure are the small part of the valve casing between the pistons of the high pressure valve, and the high pressure cylinder. The steam, on leaving the latter, exhausts over the ends and down the centre of the piston valve direct into the valve casing beneath. This casing is made of considerable capacity in order to form a receiver between the two cylinders. The object of this is to enable the steam admission to the second cylinder to be closed sufficiently early to prevent the exhaust pressure in the high pressure cylinder from falling too low; which was a great defect in the old double cylinder on the "Wolf" compound engines in which the exhaust

pressure of the high pressure cylinder was nearly as low as the final expansion pressure in the low pressure cylinder, involving much larger ranges of temperature than was necessary. From this casing the steam is distributed to the second cylinder in the usual manner, and is then exhausted into a receiver formed round the second cylinder, as is customary in the high pressure cylinders of ordinary compound engines. From thence, by suitable passages, it reaches the space between the pistons of the piston valves of the third cylinder, and so on, as described for the first pair of cylinders, until it is exhausted in the condenser.

Having so fully described Mr. Walter Brock's patent quadruple-expansion engines as fitted on the s.s. *Buenos Aires*, an enumeration of the various advantages obtained by the adoption of this particular design of marine engine is barely necessary. At a glance it can be seen to be especially suited for the conversion of existing "compound" engines into "quadruple." The lower parts of the engines, crank-shafts, &c., remaining the same, only new cylinders and new valves being requisite, and it is no matter of surprise that already a number of existing marine engines have been so converted.

This type of engine has only been manufactured for slightly over three years, but during that period as many as twenty-two engines have been finished and eight are at present in progress or under order. Several of the largest steamers of the British India fleet, the British and Burmese Steam Navigation Company, have been fitted with these engines, in addition to vessels of the *Compania Transatlantica*, and other companies.

As good running jobs, we are informed they are equal to the three-crank triple-expansion or compound engines. This is accounted for by the superior compression in the high pressure cylinder. As an instance of their regular motion, it may be stated that the Brock patent quadruple-expansion engines have been run with the crank-pin brasses quite loose without any knock. Although the highest steam pressure that has hitherto been adopted by Messrs. Denny and Co. is only 180 lbs., but slightly in excess of the pressure usually used in triple-expansion engines, a saving in coal consumption of from 6 to 8 per cent. has been obtained—as compared with triple-expansion engines.

#### THE EXHIBITS OF THE CROSBY STEAM GAGE & VALVE COMPANY, BOSTON, U.S.A.

THE Crosby Steam-gage and Valve Company, of Boston, Mass., U.S.A.; 75, Queen Victoria Street, London, and 10, Rue Lafitte, Paris, had, at the Paris Exhibition, a very handsome collection of their various specialities in indicators, lubricators, steam whistles, &c. As the Crosby patent indicator and Crosby patent lubricators have features of special interest, the following illustrated descriptions will be worthy of the notice of our readers.

Experience with steam indicators has demonstrated that with the higher speeds now in vogue, improvements have been rendered necessary. Many details which gave little trouble at slow speeds, cause errors under the present requirements which seriously affect the results. The Crosby patent steam engine indicator

has overcome many objectionable features, and has already, in consequence, been largely adopted in America, Great Britain, and on the Continent. In Fig. 1 we illustrate the external appearance of the indicator, and in Fig. 2 give a sectional view, and Fig. 3 shows the Crosby spring.

It will be noticed that the movement of the piston is transmitted to the pencil by a simple parallel motion which gives it a movement in a straight line, at right angles to the atmospheric line. The movement of the piston is multiplied to give a diagram of convenient size, and at the same time to have the movement of the spring so slight, that the pencil will immediately respond to any change of pressure in the cylinder. The levers of the pencil movement are made as light as every-day use will permit, to avoid

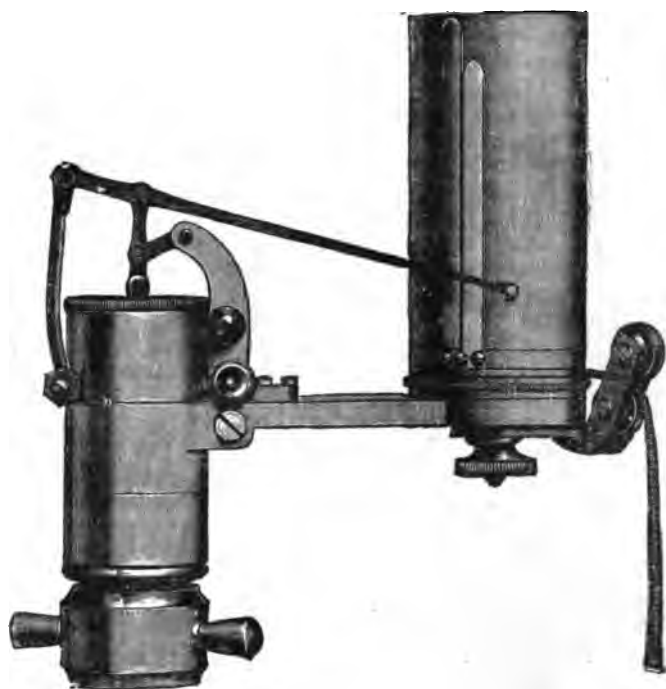


FIG. 1.

all errors from momentum. Each joint is formed by a hardened steel pin, having a bearing of similar material. Examining Fig. 2, it will be seen that the piston-rod C is efficiently guided, owing to the depth of the cylinder-cap through which it passes. The piston H is made as light as possible and fits the cylinder loosely enough to allow slight leakage. The piston is also provided with steam chambers in the outer surface, on which the pressure of the steam acts, preventing the piston from deviating from its proper course. The leakage of the piston does not result in perceptible error, for as it has been pointed out unless the leakage "be sufficient to add to the atmospheric pressure above the piston, it cannot affect the accuracy of the indications." The large relief holes in the Crosby indicator prevent any such accumulation of pressure above the piston.

In order to remove the piston, the cylinder-cap A is unscrewed and raised, along with the sleeve B B, carrying the pencil movement. The cylinder and piston can then be cleansed and lubricated. To remove the spring, the cap A is unscrewed from the spring-head D; and the piston-rod C is unscrewed from the swivel-head E. The spring may then be removed by unscrewing the piston-rod out of the piston H. The pins or screws of the joints, K, I, L, M, never require to be removed, but have to be kept well lubricated.

The indicator spring, from Fig. 3, will be seen to be of special make. It is made of a single piece of steel wire, wound round from the middle into a double coil, the two ends being secured by screwing them into the four webs of which the head is formed. The

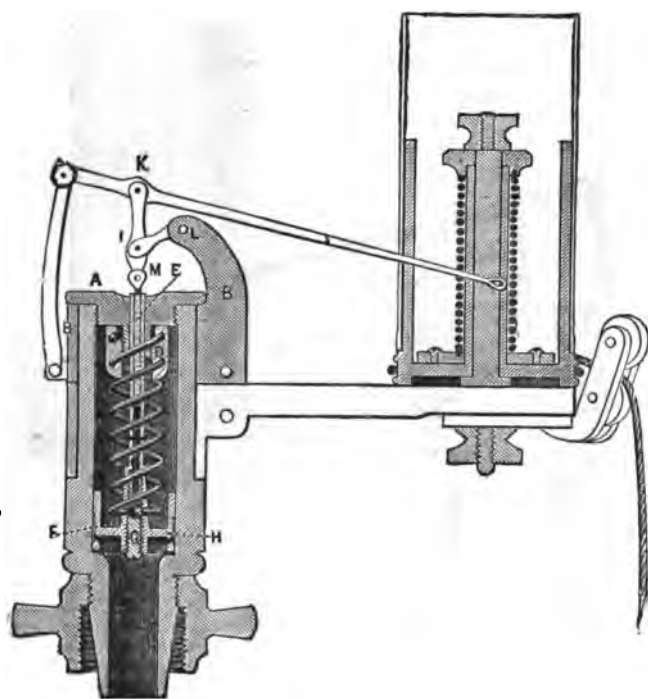


FIG. 2.

spring is adjusted by screwing it in and out of the head, and not by grinding the wire. The bottom of the spring has a small steel bead brazed on the wire, which bead it will be seen, from Fig. 2, has its bearing in the centre of the piston, so that twisting tendencies in the spring are not transmitted to the piston.

In the drum a short spiral spring is fitted, as this form of spring gives, at the beginning of the stroke in one direction, a comparatively slight resistance, which gradually increases until it reaches the maximum at the end of the stroke. In the other direction the strength of the recoil is greatest at the beginning of the stroke, and gradually decreases until the end of the stroke is reached. A small and light drum has been adopted, as experience has shown that the variations in the stresses on the cord were increased

by the inertia and momentum of the large drums, and errors thereby occasioned.

Nothing need be added to the foregoing description to show our practical readers that the Crosby Patent is a decided improvement on ordinary indicators, especially for high speeds.



FIG. 3.

Amongst the remaining exhibits of the Crosby Steam Gage and Valve Company, which included a number of Crosby pop safety valves, automatic and certain in their action, and prompt in opening and closing; besides the Crosby water relief valves, the Chapman Fullway stop valves, and the Crosby single bell-chime steam whistle, there were a variety of lubricators deserving of special notice.

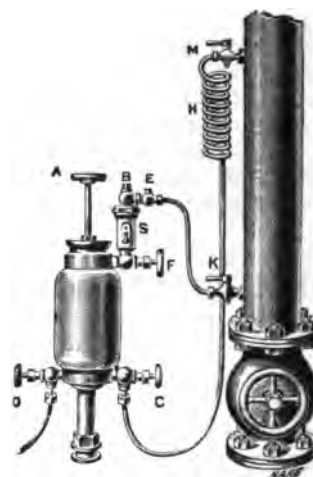


FIG. 4.

In Fig. 4 is shown an external view of a Crosby single-sight feed lubricator, attached to an adjoining steam pipe; and Fig. 5 is an enlarged sectional view of the lubricator. Steam is taken from the pipe through the cock M, and it passes into the coil H, in which it becomes condensed; the water passes through the valve C into the oil reservoir, and the hydrostatic

head due to this column of water forces the oil through the valve F into the sight-feed S. Drops of oil thus pass through the water in the sight-feed to the check-valve E and into the small steam pipe, thence through the cock K to the main steam pipe.

The economy of sight-feeding is generally admitted, and in the Crosby patent lubricators, by regulating



FIG. 5.

the valve F, the supply of oil can be reduced to a minimum consistent with perfect lubrication. This type of lubricator can also be fixed in any convenient place in the engine-room, the oil being conveyed by means of copper pipes to the engine.

It is sometimes desirable to use one lubricator to oil two or three separate cylinders or engines. To meet these requirements, lubricators with two and three

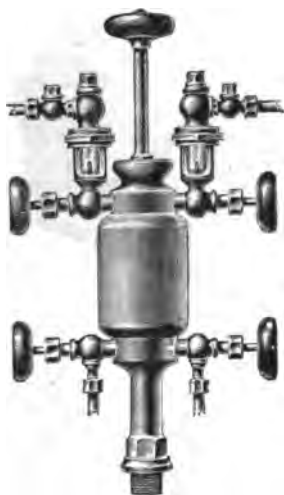


FIG. 6.

sight-feeds are made similar in design to the ordinary lubricator, as shown respectively in Figs. 6 and 7. The Crosby lubricator with three sight-feeds has been frequently applied to the enclosed type of engine; one "sight-feed" being used to lubricate the valves and cylinder, and the other two to lubricate the crank-pin-eccentric, and main bearings.

As it is not always convenient to have two connections to the steam pipe, a modified Crosby patent sight-feed lubricator has been designed, having only one steam connection, which we illustrate in Fig. 8. Instead of having a separate condenser, the oil reservoir is made relatively larger, so that the entering steam through the valve B is condensed by radiation. When

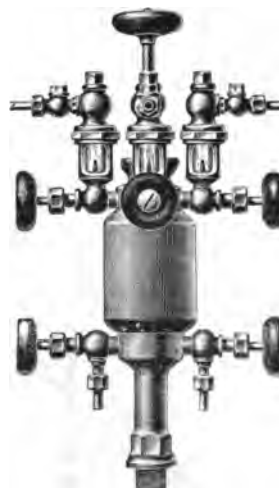


FIG. 7.

the valve A is opened, steam fills the sight-glass, and by means of a small central tube is carried to the top of the oil reservoir. The pressure in the lubricator is then equal to that in the glass; but when the steam leaves the top of the central tube it comes in contact with the cold oil, is condensed, and the water thus formed falls to the bottom of the oil reservoir, and forces the oil out through valve F. The oil can be seen

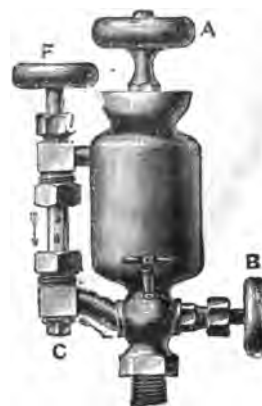


FIG. 8.

dropping down through the steam in the glass as it passes to the steam pipe or steam chest of the engine.

In closing our description of the exhibits of the Crosby Steam Gage and Valve Co., a word of praise is due to the company for the high-class finish and workmanship of their manufactures, which have won the highest award, a gold medal, for the best specimens of engine and boiler fittings in the exhibition.

## FRENCH SHIPBUILDING AND BOILERMAKING MACHINE TOOLS.

IT cannot be said that there was a first-class representation of the British manufacturers of shipbuilding and boiler-making machine tools at the Paris Exhibition, but several Continental firms had a large number of this class of machinery. Prominent amongst the number were Messrs. Sculfort-Malliar and Meurice, of Maubeuge, who had a large collection

angle-punching and shearing machines. The main casting is of the box form, and the shaft is of wrought steel. As already indicated, the machine is double-acting, the punch being placed outside, and the shears midway in the gap, which is 20 inches wide. The bolster in connection with the shears, as previously stated, is removable, so as to clear the whole of the gap when wider material than ordinary angles or bars, requires to be punched. The shears and punches are of specially hard steel, and both are fitted with instantaneous disengaging gear. In a simpler

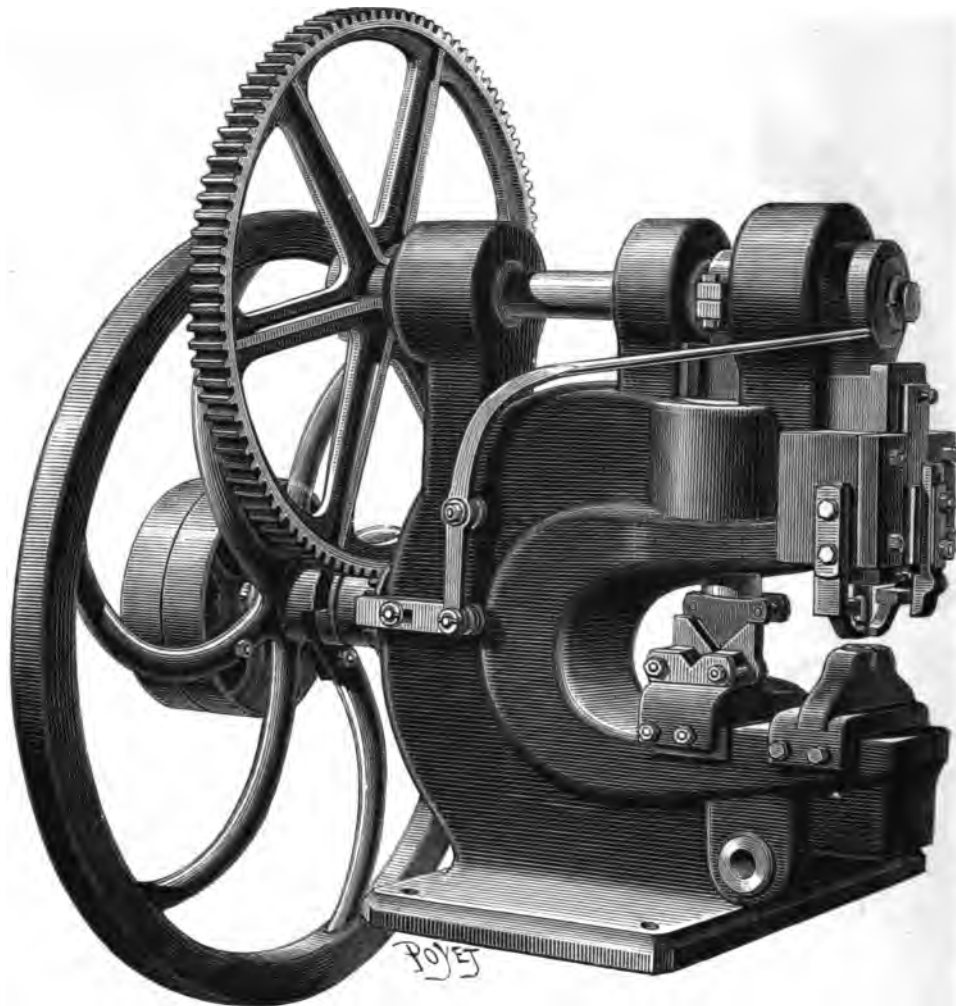


FIG. 1.

of machine tools in the French section of the Palais des Machines. Those we have singled out for notice will serve to illustrate some Continental designs of punching and shearing machines.

The punching and shearing machine, illustrated in Fig. 1, is in one respect similar to that of other Continental manufacturers, who were exhibitors, in having a portable arrangement of bolster for shearing, within the gap of the machine. Our illustration, — 1, represents Messrs. Sculfort-Malliar and Meurice's improved make of combined plate-bar and

form of this type of machine, the shearing operation is performed only at the front, the punch and die being removed, and small shears being fitted in their place; an arrangement that is, no doubt, found advantageous where there is not accommodation for more than one machine, and where the work to be dealt with is limited in extent. The machine illustrated in Fig. 1 weighs about  $3\frac{1}{2}$  tons, and will punch  $1\frac{1}{2}$  in. hole in  $1\frac{1}{2}$  in. plates, and shear 2 in. square bars and 4 in. angles in the middle shears. In front, it will shear plates up to 9-16 in. in thickness. A

smaller size of machine of the same type, adapted or hand power, was also exhibited.

Our remaining illustrations, Figs. 2 and 3, are respectively of Messrs. Sculfort-Malliar and Meurices' hydraulic shearing and punching machines. The former (Fig. 2) represents a shearing machine which can be actuated either by hand or by belting, and the latter (Fig. 3) a hydraulic punching machine, in which the tool is worked by a hand-lever and force-pump. These machines are all made in five sizes; the largest, which were exhibited, being capable of punching holes

Reverting to the machine illustrated in Fig. 2, shewn fitted with shears, in other respects it is similar to that shewn in Fig. 3 and of the same power; but owing to its adaption for belt power, &c., of somewhat increased weight, the smallest size being 887lbs. and the largest 6,175lbs.

Our visit to the stand of Messrs. Sculfort-Malliar and Meurice, of Maubeuge, proved to be of considerable interest; and on the closest inspection we found the machines exhibited to be of first-class workmanship and of thoroughly substantial design. The agents of

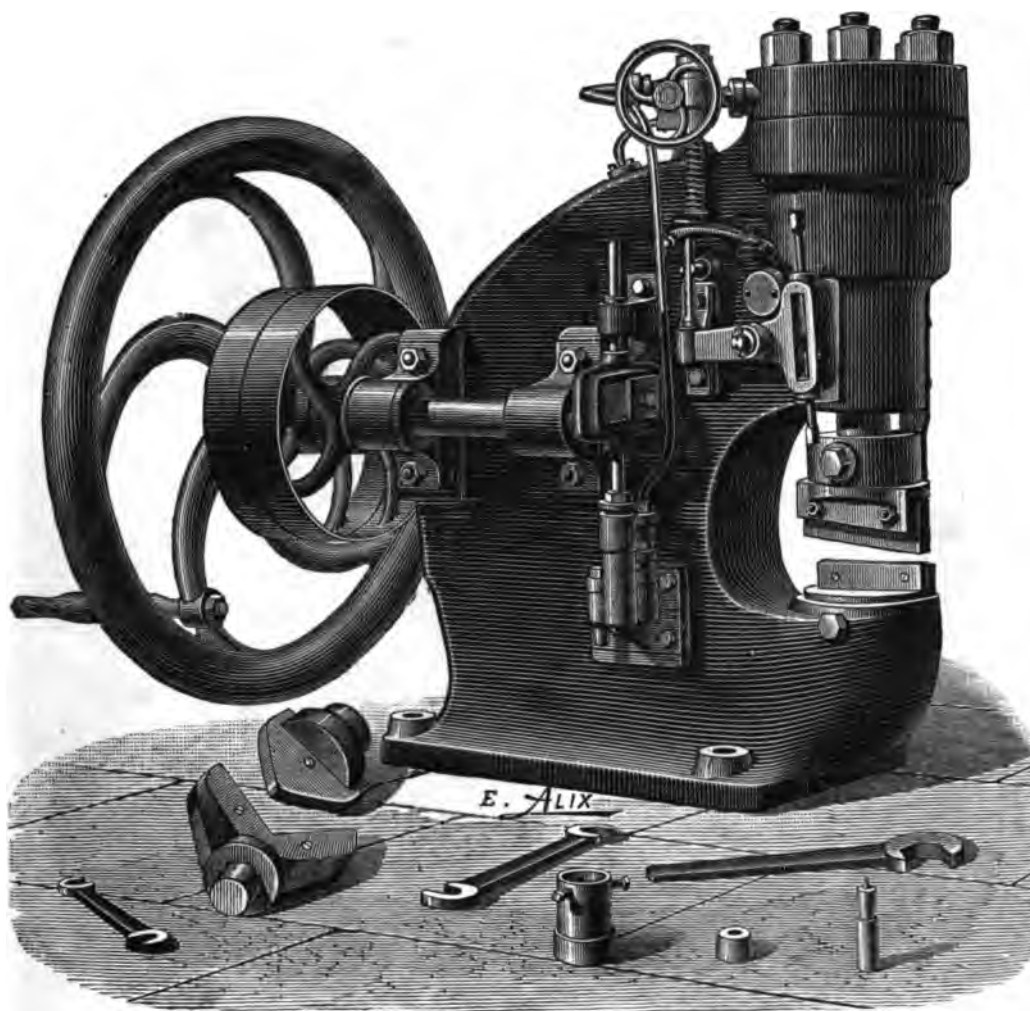


FIG. 2.

1½ in. diam. in 1¼ in. plates. The machines have, however, only small gaps, varying from 4½ in. to 11½ in., and are thus principally useful to iron merchants. Their weight is moderate, varying from 716lbs. in the smallest, to 4,411lbs. in the largest size. As in the previously described machine, the punch and bolster are removable, and can be replaced by shears capable of shearing 2½ in. square bars and 5 in. angle bars. The reservoirs are filled with water mixed with glycerine, thus obviating corrosion and permitting of work being carried on uninterruptedly in frosty weather.

the makers in this country are Messrs. H. and F. Bonten, Suffolk House, 5, Laurence Pountney Hill, London, E.C.

#### THE EXHIBITS OF THE COWLES ELECTRIC SMELTING AND ALUMINIUM COMPANY.

CONSIDERABLE interest attaches to the exhibits of the Cowles Electric Smelting and Aluminium Co., as this company has now works at Milton, Staf-

fordshire, as well as at Lockport, New York, U.S.A. At the latter works there are 14 furnaces, worked by three dynamos capable of supplying a current of 3,000 to 3,200 ampères at a pressure of 55 to 60 volts. The works produce 2,500 lbs. of 10 per cent. aluminium bronze and 1,800 lbs. of 10 per cent. ferro-aluminium per diem. The works at Milton, Staffordshire contain 12 furnaces, with almost an equal output to the American works.

The aluminium bronzes are the most valuable of the alloys, a bar containing 11·0 per cent. aluminium

copper spelter and aluminium, have properties which make them comparable with gun metal and other bronzes used as cast, rather than with the brasses proper mainly composed of copper and spelter. Mr. Farquharson also states that the Cowles Company's No. 2 Aluminium Brass is the best metal for screw propellers, stern frames, and sterns of ships, at present known, and is remarkable for the qualities required in such work, having a wonderfully high elastic limit, great tensile strength, and resistance to corrosion. We understand that three large bars of

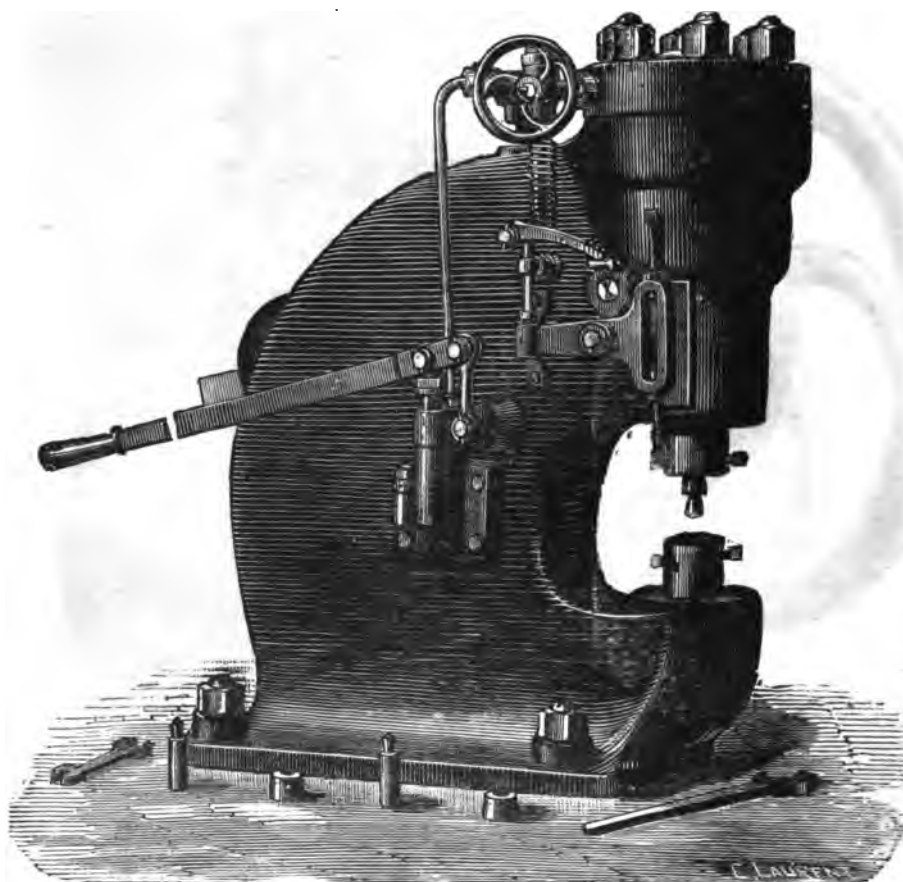


FIG. 3.—HYDRAULIC PUNCHING MACHINE.—See page 363.

having given a tensile resistance of 57·27 tons, and one containing 7·5 per cent. 36·78 tons, to the square inch. In resistance to compression these alloys equal the best steel, and the transverse strength, or rigidity, is 40 times that of brass. Its elastic limit is higher than that of mild steel, and it can be worked at red heat like wrought iron. It has been pronounced by Mr. J. Farquharson, the chief metal expert to the British Admiralty, as the most superior metal in use, and the same gentleman states that the various grades of aluminium brasses, composed of

this brass have lately been tested at Lloyd's Proving House, with the following remarkable results :

Diameter of Bar. Inches.	Ultimate stress per square inch of original section.	Elastic Limit per square inch of original section.	Length of Bar. Inches.
1·03	34·27	Not taken	6
2·05	32·11	30·0	8
3·10	29·79	28·51	7·5

Such a metal as this must prove an inestimable boon to shipbuilders and marine engineers who

want a strong brass which casts clean and sound.

At the Paris Exhibition an illustration of the latest form of furnace adopted by the company in manufacturing their alloys of aluminium was exhibited, as well as a collection of photographs of the interior of their works; but more interesting were the samples of aluminium bronze, silicon bronze, and ferro-aluminium. The latter promises to create a revolution in iron foundry and steel manufacturing, the addition of a small percentage in an ordinary puddling furnace producing the finest mild steel; and, as aluminium is an anti-corrosive, it will not be surprising, now that it is to be obtained at a comparatively low price, that its adoption by iron and steel manufacturers will secure for shipowners a material that will be vastly superior to the "mild steel" of the present in resisting corrosion.

Specimens of ore, corundum from Georgia, U.S.A., aluminium ready for the market in various grades, including Hercules metal and aluminium silver, each having a polished surface to show the perfect structure of its casting, and each labelled with its tenacity and percentage of elongation, were also deeply interesting, but pressure on our space prevents a detailed reference to these materials, of which, in the early future, no doubt much more will be heard.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from October 25th to November 23rd, 1889:—

Anderson, Arthur R., assistant engineer to the *Defiance*.  
Austin, Frederick W., engineer to the *Immortalite*, to date November 19th.  
Beal, William E., staff engineer to the *Sultan*.  
Burgees, John H. A., assistant engineer to the *Australia*, to date November 19th.  
Burstow, Hugh, staff engineer to the *Indus*, additional, to date November 19th.  
Edwards, Ernest, assistant engineer to the *Monarch*, to date November 19th.  
Faulds, Arthur G. J., engineer to the *Australia*, to date November 19th.  
Grant, William H., engineer to the *Pelican*, to date November 19th.  
Guise, Bertram J. R., engineer to the *Hercules*, to date November 19th.  
Ham, John W., engineer to the *Barham*, to date November 1st.  
Hughes, Thos., staff engineer to the *Australia*, to date November 19th.  
Irvin, William, engineer to the *Sultan*.  
Jefferies, John, fleet engineer to the *Hong Kong Yard*, to date November 20th.  
Kerr, Alexander, engineer to the *Bramble*, to date November 19th.  
M'Avoy, Wm. R., fleet engineer to the *Active*, to date November 15th.  
M'Carthy, John, chief engineer to the *Achilles*, to date November 15th.  
Mitchell, Frederick, chief engineer to the *Rattlesnake*, to date November 3rd.  
Moon, Henry J. J. G., chief engineer to the *Tyne*, to date October 31st.  
Moysey, William H. S., assistant engineer to the *Australia*, to date November 19th.  
Norgate, Robert S. G., engineer to the *Redpole*, to date November 20th.  
Palmer, Alfred, staff engineer to the *President*, to date November 1st.  
Pill, Joseph H., engineer to the *Pembroke*, additional.  
Rayner, Alfred, chief engineer to the *Gossamer*, to date November 15th.  
Riley, William H., chief engineer to the *President*, additional, to date November 1st.

Smith, Alexander G., staff engineer to the *Iron Duke*, to date November 15th.  
Stephens, L. J., assistant engineer to the *Camperdown*, to date November 23rd.  
Stuart, James J., chief engineer to the *Phoenix*, to date November 13th.  
Taylor, Ernest F., engineer to the *Hong Kong Yard*, to date November 20th.  
Vogwell, Charles A., fleet engineer to the *Ruby*, to date November 15th.  
Weeks, E. J., assistant engineer to the *Camperdown*, to date November 23rd.  
Wheater, Percy, probationary assistant engineer to the *Active*, to date November 19th.

### HOAR & BROWN'S HARDWOOD MARKET REPORT, November 24th, 1889.

TEAK.—The deliveries from the 1st to the 21st November were 2,458 loads, against 1,139 loads during the same period last year.

The stock on the 1st November was:—

1889.		1888.		1887.	
Logs.	Planks.	Logs.	Planks.	Logs.	Planks.
Moulmein 2,023 Lds.	906 Lds.	3,325 Lds.	768 Lds.	7,839 Lds.	487 Lds.
Rangoon 3,116 "	480 "	1,590 "	441 "	1,218 "	186 "
Bangkok 859 "	804 "	788 "	198 "	2,008 "	277 "
Totals 5,998 Lds.	1,690 Lds.	5,698 Lds.	1,407 Lds.	11,045 Lds.	900 Lds.

The market remains firm, although the stock has been further increased by the arrival of four cargoes, viz.:—*Louis de Geer*, *Drot*, *Leona*, and *Perga*; but as engagements have already been entered into for the greater portion of this wood, the arrivals will have very little influence upon the market, and prices will remain unaltered. The position has been further strengthened by the placing of orders for about 4,000 loads for the Admiralty.

Latest advices from Moulmein show that the supplies from that port will be of a very limited character. We shall, therefore, have to look chiefly to Rangoon and Bangkok shipments for our supplies.

MAHOGANY.—A good demand continues to prevail, and as the deliveries are heavy, there is every indication of increased prices for wood of good quality and sizes. The outlook is encouraging, although the minimum price may be slightly reduced for a time in consequence of some very inferior shipments being placed upon the market.

CEDAR.—Prices will no doubt take a downward tendency, as a large quantity of wood is likely to be offered at public sale without reserve during the present month. The demand is weak, and holders of stock generally are anxious to realize.

WALNUT LOGS.—The market has experienced a change for the better, and is likely to continue improving. There has been a fair amount of business done during the last month, and deliveries compare very favourably with those of the last few months.

American imported cut planks and boards are finding ready buyers, and prime goods are realizing very fair prices. The fact of freights having risen lately will prevent further shipments of the inferior class of goods with which this market is glutted, and give an opportunity of reducing the stock.

SEQUOIA.—Very little has been done since the last sale without reserve, and as advices are to hand of further shipments destined for London, we expect to see prices lower again.

### ANGIER BROTHERS' STEAM FREIGHT REPORT, November 16th, 1889.

FREIGHTS since our last list day have been well sustained, with few exceptions, and a good business doing. China and India remain dull and poor. A number of engagements were made from Burmah Rice Ports for February—March, but the demand has slackened off and rates are weaker. Calcutta, Madras Coast, Bombay and Kurrachee take but few boats at low rates. Black Sea business has been good at improved rates. Azoff paid full rates for the last few boats, the season thence may be closed any moment; a few steamers have been taken up for next spring. Odessa improved for prompt and early December, and Danube took its share of tonnage off the market.

Mediterranean business has been good for ore, grain and fruit to U.K. and U.S. The Baltic demand has considerably fallen off. From America full employment has offered for all tonnage directed that way, and rates have been well kept up, but the present demand is easier and bids come rather under the late good rates. The Brazils offer a few cargoes of sugar and coffee to U.S. and U.K., but at rates which fail to attract owners. From the River Plate a few grain cargoes are obtainable for December loading. Outward coal rates to the Mediterranean have kept up, and a number of fixtures taken place, but to India and far East rates are low and the demand limited. Berth rates are steady to River Plate and Brazils; to India, China and Australia there is room for little tonnage beyond the liners.

Shipbuilders and engineers continue very full of work, and ask low prices for new contracts. Iron continues to boom. Steel and other materials and labour keep high. New tonnage is worth £10 per ton deadweight carrying, and very few boats offer for prompt or early delivery. Second-hand steamers are more saleable at advanced prices.

## NAVAL ARCHITECTURE AND MARINE ENGINEERING.

### III.—CLYDE FIRMS.

**A**MONGST the British exhibitors in the class assigned to Naval Architecture and Marine Engineering at the late Paris Exhibition, the largest collection of ships' models was exhibited by Messrs. R. Napier & Sons, Lancefield, Glasgow. In our limited space we cannot do justice to the collection, which represented upwards of 60 vessels, built by the firm, and which was further enhanced in value by the addition of a large number of photographs of machinery constructed and fitted by the firm. More especially is it difficult to enter on a description of the exhibits of Messrs. R. Napier & Sons, which should not exceed ordinary limits, as the vessels represented include various classes of mercantile and home and foreign Government ships, and have been constructed during a period of nearly half a century, which embraces in reality nearly the entire development of steam shipping. There is also a decreased necessity for a detailed account of the vessels represented, as on the occasion of the Liverpool Exhibition, 1886, in the July number of the *MARINE ENGINEER*, a similar but larger collection of Messrs. R. Napier & Sons, was described at length.

Glancing then chronologically at the models of vessels built for private firms, in that of the paddle-steamer *Vanguard* we see one of the earliest, if not the first, of the vessels that this firm built of iron, the vessel being specially constructed for the Dublin & Glasgow Steam Packet Co. in the year 1848. Three years earlier Messrs. Napier were constructing the marine engines for the first four steamers of the Cunard Co., the hulls of which were built of wood, for it was not until the year 1855 that this Atlantic mail and passenger steamship company had a vessel, the *Persia*, built of iron, the second vessel to be constructed of that now nearly ancient but then modern material being the famous *Scotia*, launched in the year 1861—of which the model was exhibited. One of the passages of this vessel from New York to Liverpool, including detention at Queenstown, was made in 8 days, 22 hours, which broke all previous records. It may be interesting to point out that even twenty-eight years ago economy in coal consumption was being obtained, for while in the first Cunard liner, the s.s. *Acadia*, the consumption was 4.7 lb. of coal per I.H.P. per hour, in the *Scotia* it was reduced to 3.65 lb. The model of another steamer built by Messrs. Napier in 1861 is also exhibited, viz., that of the steamer *China*, of the British & North America Royal Mail Co.; but passing on we see, and very appropriately, a similar representation of the steamers *Periere* and *Ville de Paris*, built by the firm for the Compagnie Générale Transatlantique, a company formed on August 21st, 1861, succeeding to the Compagnie Générale Maritime, and which now constructs its own vessels at Penhoet, St. Nazaire, as well as their machinery. In our notice of French Naval Architecture special mention will be made of this company, which had the largest and most unique exhibit of naval architecture ever seen at any exhibition, in the large and realistic panorama near the Quai d'Orsay. Another important steamship company—the Pacific Steam Navigation Co.—was represented by four models of several

vessels built by Messrs. Napier, including the *Valdivia*, built in 1870; the *Garonne*, launched in the following year; the *Gallicia*, constructed in 1873; and the *Pizarro* and three sister vessels, built six years later.

Another well-known mail and passenger steamship company was represented, viz., the Allan Line, by the model of the *Parisian*, built in 1881, and which ever since has remained the "crack" vessel of the owners' fleet. This vessel is credited with a speed of 15 knots on a displacement of 9,663 tons, obtained with 6,000 I.H.P.

Messrs. George Thompson & Co.'s *Aberdeen*, one of the first vessels to be fitted with triple-expansion engines, was one of the most interesting vessels represented by a model on the builders' stand, its load displacement being 6,782 tons, and the I.H.P. 2,682. The successive voyages of this vessel between the United Kingdom and Australia on a mean consumption of 1.65 lbs. of coal per I.H.P. per hour, it is now well known, did so much to demonstrate the economy of the triple-expansion engines.

An exceptionally well-finished full model, showing the deck and rigging work down to the minutest details, of the steamers *Mexico*, *Tarmanapas*, and *Oraca*, built in the years 1883 and 1884 for the Compania Mexicana Transatlantica, commanded universal approbation, and justly, as these vessels are splendid specimens of modern naval architecture, having attained a speed of 16½ knots with 5,450 I.H.P. on a load displacement of 7,242 tons.

Vessels built in the year 1885 were represented by models of the *Electra* and *Recorder* of 1,907 tons displacement, with engines indicating 1,378 H.P., and those of the following year by the model of the somewhat smaller but more powerfully engined *Mirror*, of 1,550 tons displacement, and engines indicating 1,750 H.P., built for the Eastern Telegraph Co., Limited.

The models of the steamers *Australian* and *Damascus*, built in the year 1887 for Messrs. George Thompson & Co., of 6,070 tons displacement, and engines of 8,090 I.H.P., and that of the s.s. *Dora*, built during the present year, completes, we believe, the representation by models of mercantile vessels on Messrs. R. Napier & Sons' stand. The latter vessel has a drooping keel, to obtain sufficient draft at the after end for the immersion of the propeller, and has fine lines. A speed of 16½ knots has been attained by the *Dora*, with 2,632 I.H.P. on a load displacement of 1,288 tons.

Although many of the models already alluded to are half-blocks, owing to the nature of the stand, &c., their effectiveness was materially increased by mirrors placed on a level at each end and at the back of each model, thus showing the deck fittings, &c., in full, and reflecting the form of the fore and after ends.

As might be expected from the considerable experience of Messrs. R. Napier & Sons as constructors of the engines and hulls of war vessels, their exhibits of this character are most complete, a brief reference must, however, suffice.

The earliest built vessel for the British Government, represented by a model, is the troopship *Simoon*, which was launched in 1849. This vessel's load displacement was 2,330 tons, and the engines of the horizontal-oscillating type, 62½ in. diameter, 3 ft. stroke. Next in order comes the armour-clad floating battery *Erebus*, built for the Crimean War, and fitted with engines of the same type as the *Simoon*. The *Black Prince*, constructed in 1861, is also to the fore—a vessel which was for many years one of the principal in the Channel Fleet, but now obsolete, both as to the design of hull and armour plating—4½ in. in thickness—and as to the type of engines—horizontal trunk. Equally true is this of H.M.S. *Hector*, an armour-clad ram of 6,550 tons displacement, and with similar engines of 3,253 I.H.P., built two years later. Although the intrinsic interest in these designs is comparatively small, except from a historical point of view, to the non-technical but intelligent visitor, these models could scarcely fail to be interesting and instructive as the disposition of the various thicknesses of armour and other plating was carefully delineated—each individual plate being shown, and with its thickness marked. The armour-clad turret vessel *Rolf Krake*, of 1,340 tons displacement, built in the same year as the *Hector* for a foreign Government, was also represented by a model, as were also the Turkish Government armour-clad frigates, *Osman Chanzy*, *Abdul-aziz*, and *Orkhan*, built by Messrs. R. Napier & Sons in the year 1865. As the armour plating of these vessels—5½ in. in thickness, extending all fore and aft—was placed at the water line, partially above and partially below it, these vessels might in this respect be considered to be of the now much adopted "belted cruiser" type. A very different type of vessel is represented by two models of the Dutch war

vessels, *De Buffel* and *De Tijger*, both constructed in the year 1868. Although not differing considerably in length and breadth and having about the same amount and thickness of armour plating, and both carrying two 13-ton Armstrong guns, the draught of water of the latter was only 8 ft. 10 in. against 15 ft. 6 in. in the former. The speeds similarly differed from 8 knots to 12½ knots, and necessarily the size of engines and boilers and the coal capacity, the *De Buffel* being intended for ocean steaming, and the *De Tijger* merely for coast defence.

All the remaining vessels of which we noticed models were those of vessels constructed by Messrs. R. Napier & Sons for the British Government. Several of these are armour-clads, viz., the *Audacious* and *Invisible*, built in the year 1869, the armour-clad ram *Hotspur*, built in the following year, and the armour-clad frigate *Northampton*, launched in the year 1877. It may be remembered that about seven years ago, the *Hotspur* was virtually re-constructed by Messrs. Laird Brothers, Birkenhead, and there is not much doubt as to whether the *Hotspur*, as well as the *Northampton* are now practically obsolete. When the cost of constructing such vessels is remembered, the question presents itself as to whether it is not possible to design war vessels which will not so rapidly pass out of date. The *Northampton's* hull cost £296,836, and the machinery, constructed by Messrs. Penn & Co., £98,968, yet this vessel with her 14 knots speed, 9-in. armour and 12-ton guns, in less than 12 years is out of the running. It is to be hoped the "belted" and "protected" cruisers will not be so readily rendered useless for effective service. A large number of these classes of vessels, built by Messrs. R. Napier & Sons, are also represented by models, viz., the protected cruiser *Leander*, *Arethusa*, and *Phaeton*, which are armed with 10 5-ton guns of 6 in. calibre, besides machine guns, and four launching torpedo carriages. These vessels were designed for 18½ knots, but 17 knots is their speed, according to Lord Brassey's *Naval Annual*. They are of the same length as the "belted" cruisers, two of which, the *Australia* and *Galatea* were represented by a model, of which it is unnecessary to give any description, as they have so frequently been alluded to in our pages.

The photographs exhibited by Messrs. R. Napier & Sons are four in number, three of them being of triple-expansion engines, viz., the s.s. *Aberdeen's* of 2,700 I.H.P., constructed in the year 1881; the s.s. *Australian's* of the same power, built three years later; and the twin screw engines of the Russian iron-clad *Sinope*, of 12,600 I.H.P. This vessel was the first war vessel to have triple-expansion engines, which were constructed in the year 1886. The remaining photograph is of the belted cruisers *Australia* and *Galatea*, built in the year 1887.

Next in importance amongst the Clyde establishments which were represented in the gallery of the Palais des Machines, so far as the respective exhibits are a criterion, is the Fairfield Shipbuilding and Engineering Co., Limited, Glasgow. This company exhibited, however, only five models, but had also on view a number of photographs and finished drawings. The vessels represented are mostly well-known, and have been previously described, so that a full account of their dimensions and particulars is unnecessary. Specially attractive is a well-finished model of the paddle-steamers *Queen Victoria* and *Prince of Wales*, built for the Isle of Man and Liverpool service, which in point of speed and general comfort are amongst the best vessels afloat. The Guion line is represented by the model of the steamer *Alaska*, not so long ago the fastest vessel on the Liverpool and New York service, and even now there are not many vessels that have beaten this vessel's fastest passage between Queenstown and Sandy Hook, of 6 days, 18 hours, 37 minutes. It is true we appear to be in measurable distance of a five days' passage between the South of Ireland and Fire Island, but it is just possible that neither by the White Star line nor the International & Inman line will this feat be achieved.

The builders of the *Alaska* have a design ready, and of which they exhibit a model, of a vessel to do the passage in five days, and it will not be surprising if the owners of the Guion line gave the requisite order. The principal dimensions of this proposed vessel are:—Length between perpendiculars, 560 ft.; breadth, moulded, 63 ft.; and depth, 52 ft.; the gross tonnage being estimated at 11,500 tons. Possibly quadruple-expansion engines would be adopted, say of 200 lbs. working pressure, and this feature of itself would prove, we believe, to be a great assistance to the successful solving of the problem of economically attaining such a high speed as 560 knots per diem, or 28½ knots per hour—which would be requisite to cover the 2,800 knots between land and land.

A model of the latest additions to the paddle-steamers engaged in the Newhaven and Dieppe traffic of the London & Brighton Railway Co., viz., the *Rouen* and *Paris*, was also on the stand. Having so recently described these vessels in an article on the "Passenger Steamships of British Railway Companies," in the September, 1889, number of the *MARINE ENGINEER*, pp. 223-4, further reference is scarcely necessary, but incidentally it may be stated, as a specimen of high-class naval architecture, it must be admitted the model is of a high order.

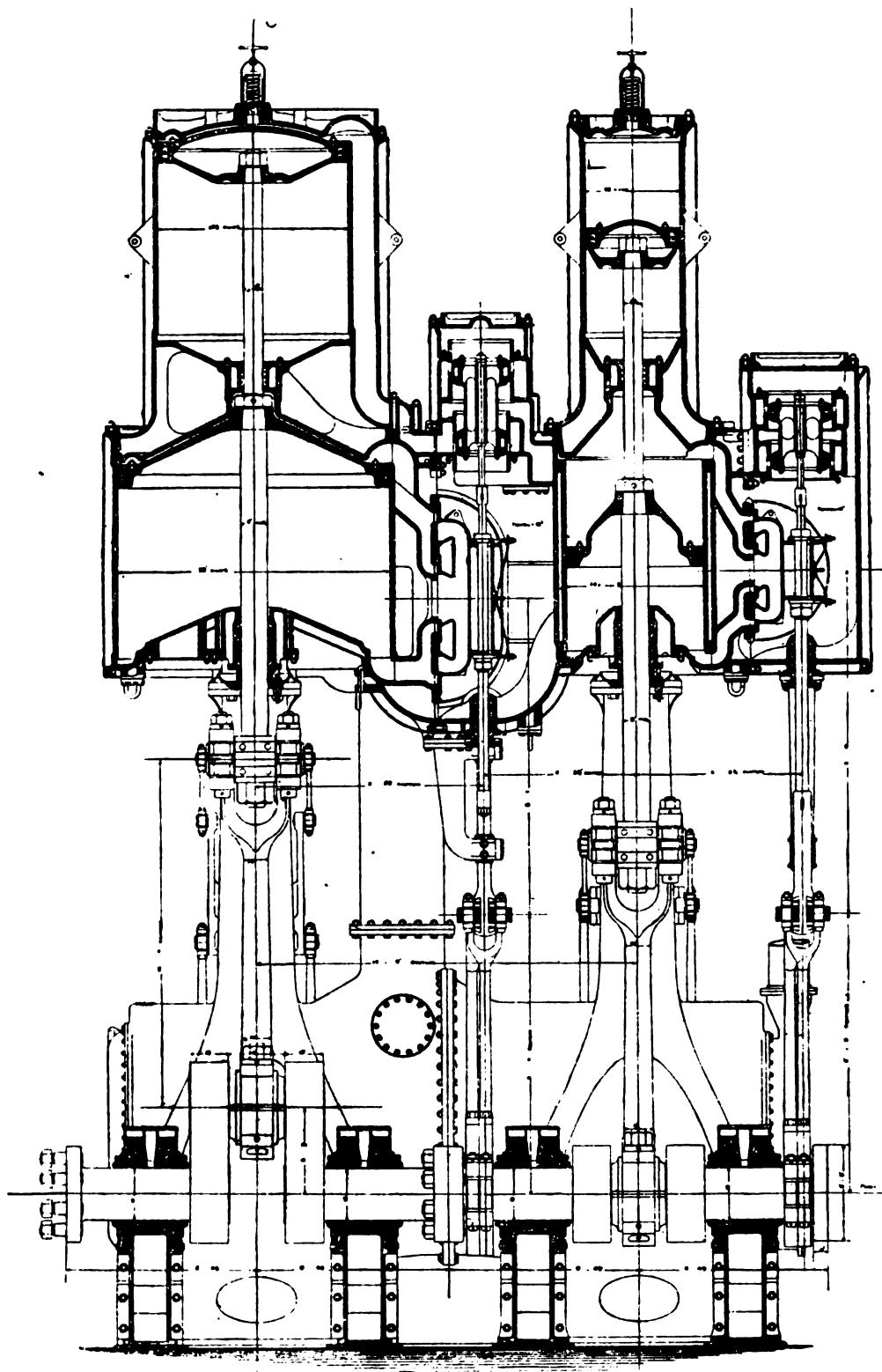
The cruisers *Magicienne* and *Marathon*, built for the British Admiralty, were also represented by a model. These vessels are 265 ft. in length, 42 ft. beam, and belong to the 20-knot *Medea* class. They are, however, wood sheathed and coppered below the water, so as to make them capable of remaining afloat for long periods without serious fouling, and consequent loss of speed, and the engines are horizontal triple-expansion, entirely below the protective deck. As these deviations from the designs of the class proper involved an addition of 200 tons in weight, making the displacement 3,000 tons instead of 2,800 tons, and requiring 1 ft. additional beam, a speed of 19½ knots was only anticipated with 9,000 I.H.P. As already pointed out on page 147 of the July number of the *MARINE ENGINEER*, this anticipation was not realised; on the final four hours' trial of the *Magicienne* with an average of 9,262 I.H.P., and a maximum of 9,607 I.H.P., the mean speed was only 19.126 knots, and to attain this speed the pitch of the propeller had been reduced from 17 ft. 9 in. to 17 ft. How far it is advisable to copper sheath war vessels, now that there is a greatly increased dry-docking accommodation, is one of the questions which may be naturally asked in connection with these vessels. These vessels have an armament of six 6-in. breach-loading rifled guns, on centre pivot mountings; nine six-pounder Hotchkiss guns, besides a number of small machine guns, and six torpedo tubes, all under cover.

Amongst the photographs exhibited by the Fairfield Shipbuilding and Engineering Co., Limited, were several of the triple-expansion engines of the *Ormuz* and the three-cylinder compound engines of the *Umbria* and *Etruria*. The high pressure cylinder of these engines is 71 in. diameter, and the two low pressures 105 in. diameter, length of stroke 6 ft., and the I.H.P. 14,500. A number of engines of various vessels under construction in the company's extensive shops at Govan were also illustrated by photographs, as also the twin-wheel steamers built in 1885 so rapidly for the River Nile Expedition. These vessels were 105 ft. in length, 18 ft. beam, 4 ft. 3 in. in depth, and had 2 ft. draught of water. The engines were compound, 12 in. and 22 in. cylinders, 42 in. stroke, and they were built, engined, and had steam up in twenty-one working days, the order being received on March 24th, 1885, and the vessels being under steam on April 16th, 1885. Photographs of the engines and hull of the famous Russian Imperial yacht *Livadia* also were exhibited, and longitudinal sectional finished drawings of the Royal Mail steamer *Ormuz* and the turret armour-clad H.M.S. *Hydra*, so that although the exhibits of the Fairfield Shipbuilding and Engineering Co. were not numerous—by their diversity, selection, and arrangement they were exceptionally interesting.

Messrs. William Simons & Co., Shipbuilders and Engineers, Renfrew, had a very interesting stand, more especially as the models exhibited were of different classes of vessels to those already referred to. As might be expected, the special types of dredgers and hopper dredgers, of which Messrs. Simons also have successfully constructed such large numbers, were represented. Two out of three models exhibited were of this class, one of which was that of the twin-screw dredger *Melbourne*, built by the firm for the Melbourne Harbour Commissioners. This vessel is of the following dimensions:—Length between perpendiculars, 207 ft.; breadth, moulded, 35 ft.; depth, 11 ft. 6 in.; and has a centre well through which a bucket ladder dredges to 37 ft. depth of water, having a lifting capacity in free soil of 1,000 tons per hour. The boilers are placed at each side of the well, and the whole of the machinery arrangements are of the most approved character.

The second model represents two combined hopper dredgers, constructed about three years ago for the Belfast Harbour Commissioners, and are known by these authorities as Nos. 3 and 4. These vessels are each capable of dredging 600 tons per hour from a depth of 35 ft., and have a hopper capacity of 800 tons. During the year 1887 these Nos. 3 and 4 craft dredged and deposited at a distance of 10 miles no less than 1,330,400 tons.

(To be concluded in our next.)



QUADRUPLE-EXPANSION ENGINE

CONSTRUCTED BY WILLIAM DENNY &amp; Co., ENGINEERS



## INDUSTRIAL AND TRADE NOTES.

## THE CLYDE AND SCOTLAND.

THE booking of orders for new shipping on the Clyde has seldom, if ever, been so heavy during any corresponding period as it has been during the past month. Reckoned by means of the orders which have been openly announced only, the aggregate amounts to about 75,000 tons; but in all probability many orders have not been allowed to transpire, and the grand total may safely be computed at over 80,000 tons. A better idea of the immensity of this figure will be had from the fact that during the month previous the total amount of new tonnage booked throughout the entire kingdom was only some 6,000 tons more. Verily, the Clyde still appears to be the shipbuilding centre *par excellence*! Many of the individual orders are for very high-class and powerful steamships for the large mail and passenger carrying companies, such as the Peninsular and Oriental Co., the Orient Co., the London & South Western Railway Co., &c. These, however, will be duly noticed under the names of the builders who have been entrusted with their construction.

The number and tonnage of vessels launched during the past month, while not commensurate altogether with its new tonnage ordered, is still very considerable, and indicates that the Clyde artisans are, on the whole, coming well up to the standard productive capacity, though minor, and happily restricted, disputes are only too plentiful. For the eleven months of the year now about over the output amounts to between 295,000 tons and 300,000 tons, a figure which exceeds that for the corresponding period in any year since 1883. The total for the whole twelve months will not fall much short of 350,000 tons, which is only 70,000 tons under the largest total for any year.

Messrs. Napier & Sons, of Govan, have booked an order for a large steamer for the Orient Co. The tonnage of the new vessel will be about 7,000 tons gross measurement, and by way of conforming to the now commonly accepted principle that too much power should not be imposed upon one set of engine and shafting, she will have twin engines, shafting and propellers, as in the case of the more modern type of high-class mail and passenger steamships. She will be much faster than any of the present Orient liners.

Messrs. Mackie & Thomson, of Govan, have contracted with Messrs. Aitken & Walker, of Hope Street, Glasgow, to build a steamer of about 4,000 tons deadweight capacity. For this steamer Messrs. Muir & Houston will make the engines, which, as a matter of course, will be of the triple-expansion type. This steamer, it may be stated, is the third presently in hand by Messrs. Mackie & Thomson for the same firm.

Messrs. Barclay, Curle & Co., Limited, of Whiteinch, have been commissioned to build and engine a steel screw steamer of over 3,000 tons for the Hansa Steamship Co. For the same owners Messrs. Charles Connell & Co., Scotstoun, are to build a steamer of about 4,200 tons carrying capacity.

Messrs. J. & G. Thomson, of Clydebank, have received an order to build three fast twin-screw passenger steamers for the London and South-Western Railway Co. for the Channel service.

Messrs. Caird & Co., of Greenock, have been commissioned, by their important customers, the Peninsular and Oriental Co., to build two more steamers, each of about 7,000 tons. The new vessels will, of course, be of steel, and will be supplied by Messrs. Caird with triple-expansion engines, capable of driving the vessel at a high rate of speed. Messrs. Caird have also secured the contract to build for the Maatschappij der Nederlanden, Amsterdam, two steamers of considerable tonnage—each of them being 360 ft. in length.

Messrs. William Denny & Bros., Dumbarton, have been commissioned by Messrs. Morton & Williamson, consulting engineers, Glasgow, to build a large fast paddle steamer, destined for service in Australian waters. Messrs. Denny have a goodly amount of new work on hand, and recently their docks have been cleared of several important new vessels. They have just begun operations on the s.s. *Africa* and *Ethiopia*, of the British India Steam Navigation Line, vessels originally built by them, which are now to undergo considerable alterations. They will be supplied with new boilers, and new quadruple-expansion engines (Brock's patent), and a new saloon and other internal fittings.

Messrs. Alex. Stephen & Sons, Linthorne, have entered into a contract for the building of a new steamer to be called the *State of California*, which is to sail under the flag of the well-known State Steamship Co., yet to have a different proprietor-

ship. The new steamer will possess all the most recent improvements, and be fitted in every respect for both cargo and passenger service. Messrs. Stephens have sold a four-masted barque of 2,000 tons, which they have nearly completed in their Dundee shipyard, the purchaser being Mr. W. J. Myers, of Liverpool. They have just laid down in the same yard another barque of 2,200 tons register.

Messrs. Russell & Co., of Port-Glasgow and Greenock, continue to re-fill the berths vacated in the same surprisingly prompt way which has earned for the firm a sort of "uncanny" reputation amongst their more slow-going competitors on the Clyde. Amongst their more recent orders are two full-rigged steel sailing-ships of about 1,700 tons register for Messrs. Thomson, Dickie & Co., Glasgow, to be named the *Templemore* and *Culmore*, and similar in all respects to the *Edenballymore*. The firm are presently building, for the same owners, a large three-decked steamer of about 4,700 tons deadweight, for Mr. G. M. Steeves, of Liverpool, to be engaged in the Liverpool and East India trade.

Messrs. William Hamilton & Co., Port-Glasgow, have contracted to build a 2,200 ton sailing-ship. The vessel will be of steel and will be supplied with all the most approved appliances to adapt her for a general carrying trade.

Messrs. Blackwood & Gordon, Port-Glasgow, since the re-organization of the firm in April last, have contracted for six vessels, the last being a steel screw steamer of 1,500 tons, intended for passage and cargo service abroad. The engines, also to be made by Messrs. Blackwood & Gordon, are to be of the triple-expansion type, capable of driving the vessel at a good speed.

Messrs. Kincaid & Co., engineers, Greenock, have contracted to supply a steamer, 120 ft. in length, for which they will supply the engines, for a Brazilian company. The same firm have received an order from the Imperial British East African Co. to build a stern-wheel steamer of light draught for navigation of inland lakes and rivers of Africa. This vessel will be fitted with Kincaid's patent arrangement for raising and lowering the wheel according to the exigencies of trim, &c.

At Leith the various shipbuilding and engineering firms are kept busily employed. Amongst recent orders is one given out by local owners, Messrs. James Currie & Co., for two vessels for their Baltic trade, 228 ft. long, 35 ft. broad, and 15 ft. deep, each to carry 1,000 tons on 12 ft. draught of water. One of these vessels is to be built by Messrs. Ramage & Ferguson, and the other by Messrs. S. Morton & Co.

Messrs. John Scott & Co., shipbuilders, Kinghorn, on the Fifeshire coast, have secured the contract to build two steam trawlers, one for Messrs. Robert Brown & Co., Aberdeen, and one for Mr. John Barclay, Aberdeen.

At Aberdeen Messrs. Hall, Russell & Co. maintain the firm position they have acquired amongst the principal building firms of the kingdom. One of the most recent orders entrusted to them is for two steam trawlers, the owner being Mr. William Gyper, Hillhead. Messrs. A. Hall & Co., also of the "granite city," have been commissioned by Mr. Thomas Walker, Footdee, to build him a steam trawler.

Marine boilermakers all over the Clyde have been receiving important additions to the ample contracts formerly in hand, and all those departments depending on this important branch of industry are consequently very busy. The Parkhead Forge Co. are engaged on a very extensive order for furnaces and plates for one of the large English engineering firms presently executing Government contracts. For the cruisers being built by the London & Glasgow Shipbuilding Co., Mr. Samuel Smillie, of the Havelock Copper Works, Lanefield Street, Glasgow, is presently engaged manufacturing the copper pipes required, amounting, it is computed, to about 80 tons. Other important piping contracts are being carried out in Mr. Smillie's works, and orders are being received for his patent boiler feed-heater, evaporator, and fresh water condenser. Local tube-makers say that they were never so busy. The orders are more than can be overtaken even though works have lately been enlarged.

The Marine Engine and Boiler Works carried on by the late Mr. William King, at Kingston Docks, Glasgow, have passed into the hands of a limited liability co., of which Mr. John Hurl is chairman, the capital being £20,000. Mr. Peterson, formerly with Messrs. Duncan, Stewart & Co., London Road Iron Works, will manage the works for the new company.

Messrs. Barclay, Curle & Co. Limited, intend removing their engineering works from Finnieston quay to Whiteinch, where their shipyard is situated, the site at Finnieston having been

acquired for the purposes of the tunnel about to be constructed under the Clyde at this spot.

Professor Barr, recently elected to the Chair of Civil Engineering in the University of Glasgow in room of Professor James Thomson, retired, delivered his introductory lecture on November 11th. Principal Caird presided, and having gracefully alluded to the services and character of the late professor introduced his successor to the students. Professor Barr took as his subject "James Watt, and the Application of Science to the Mechanical Arts," and amongst other things, said that by the patronage and protection which they extended to Watt at the most critical period of his life, the Senate of those days earned for Glasgow University the immortal credit of having started James Watt upon that series of inventions which had so altered all the conditions of life and labour. In concluding, the professor suggested, as a fitting monument to the genius of Watt, the erection in the University of such an engineering laboratory as those now possessed by Liverpool and Leeds.

Professor Jenkins, occupant of the Elder Chair of Naval Architecture in the same university, delivered the first of a course of evening lectures on the subject of "Ship Calculations," on November 13th, before a large audience. The course will consist of twenty lectures, a number, surely, which will enable the professor to say all that need be said on the subject, considering the abbreviated and mechanical modes of calculation which are now so much in vogue.

Messrs. Simpson and Wilson, C.E., the engineers of the tunnel to be constructed under the Clyde at Finnieston for vehicular and passenger traffic, have lodged their plans with the Clyde Trust in accordance with the requirements of the Act authorising the construction of the tunnel.

A strike amongst the engineers employed in several of the engineering works on the Govan side of the Clyde took place in the early part of November, and has resulted in a general lock-out, by which as many as 14 of the large Clyde engineering works are effected. The dispute is due to a demand on the part of the men for a rise of  $\frac{1}{4}$ d. per hour. This the employers at first firmly refused, and the partial strike took place. As the result of subsequent interviews between representatives, the employers conceded the promise of  $\frac{1}{4}$ d. per hour of rise, to take effect on 1st January, and another  $\frac{1}{4}$ d. rise on the 31st March. This the men, after full consideration, refused, and insisted that the first  $\frac{1}{4}$ d. advance should commence from the hour they resumed work. They, however, agreed that the second  $\frac{1}{4}$ d. advance should not be given till 1st March. This was the state of matters on Saturday, the 23rd November, and on that date the announcement of a general lock-out, previously threatened, was posted on the gates of fourteen shops. The men, up till the time of writing, are holding out for the immediate advance, and it is uncertain how and when the dispute may be settled.

In connection with the proposed Forth and Clyde Canal, now being vigorously canvassed in the East of Scotland, the full text of Messrs. D. & T. Stevenson's report has been published, and at a meeting held in Edinburgh, on the 20th November, resolutions were adopted declaring that such a canal would be of inestimable value to the nation, and appointing an influential committee to consider the scheme, and to report to a future meeting. Business gentlemen in Glasgow, on the whole, regard the scheme with apathy, although, should serious indications of the project being carried out be given, prompt action would be taken to secure the interests of the Port of Glasgow.

The Symington Memorial Committee have given up hope of ever raising the £1,000 necessary for the proposed erection of a statue to "the father of the marine engine" in Princes Street Gardens, Edinburgh. Mr. Adolph Salvesen, shipowner, of Leith, than whom no one has worked harder towards realising the sum named, made this intimation at Falkirk, on the 14th November, in the course of a lecture on "Steam Navigation," and added that the committee had collected altogether about £170, and with this sum they hoped to get a handsome marble bust of Symington, which would be placed in the Edinburgh Museum of Science and Art. If this intention is fulfilled, the bust will be the only one in existence of Symington. The Monument Committee of Leadhills, Symington's native village, some time ago resolved to erect an obelisk to his memory on a commanding site in that district, and in pursuance of this Mr. D. W. Stevenson, R.S.A., of Edinburgh, is now engaged executing medallions and panels illustrative of notable points in Symington's labours connected with the introduction of steam navigation. These sculptured subjects, which will be executed in bronze, will occupy the front and sides of the base of the monument.

## TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—The weather having been favourable during the past few weeks great progress has been made with vessels in course of construction at the various yards, and between now and the end of the year a very large amount of tonnage will be put off the stocks. Messrs. Palmer alone will launch some half-dozen vessels in the time indicated, quite half that number being, at the time of writing, about ready for leaving their respective berths. It must, of course, be recollected that this firm has two large establishments in operation, and there will therefore be nothing to wonder at if, in the output return for the current year, they occupy a position very near the top of the list. Messrs. Hawthorn, Leslie & Co. have still some vessels of a large and important class to build for foreign owners, and the whole of the berths in their extensive yard are occupied. The large Russian steamer *Eagle* recently launched by the firm is now in the graving dock receiving the finishing touches, and in this connection it may be stated that besides Messrs. Hawthorn & Leslie's there are no more than two or three graving docks on the North-East Coast that could receive this vessel, which is over 440 ft. in length, and of proportionate dimensions in other respects. The construction of the war sloop ordered by the Admiralty towards the close of last year is now well advanced, and the vessel will doubtless be put into the water by the end of February. Messrs. Armstrong, Mitchell & Co. have no less than three cruisers being fitted out beside their Elswick yard, and preparations are being made to launch another. There are also six war vessels in comparatively early stages of building on the stocks, and the greatest possible briskness prevails in all departments of the establishment. At the Low Walker yard, belonging to the firm, the same state of general activity is observable, the only difference being that in the latter case the vessels building are intended for the merchant service, while at the Elswick yard vessels of war are exclusively dealt with. Messrs. W. Dobson & Co., having recently increased their productive capacity by adding a fourth berth, are now very fully employed; among the contracts in hand being a good-sized cargo boat for Messrs. Alexander Taylor & Co., of Newcastle. The Messrs. Edwards Shipbuilding Company, Howden, and Messrs. T & W. Smith, North Shields, have each a vessel in course of construction for the same owners. Messrs. R. Stephenson & Co. are pushing forward the construction of the cruiser which they have been commissioned to build, and a good portion of the framework is now in position. The last vessel launched by the firm, which was originally intended for ordinary traffic, has been re-sold, and will be altered by the present owners (a London company) with a view to being exclusively employed in the dead meat trade. The vessel will be fitted with the refrigerating and insulating arrangements usually adopted for this special service, and a large staff of joiners and other operatives will be employed for the next five or six weeks in carrying out the work. The Blyth Shipbuilding Co. have two new steamers—one for Norway and one for Germany—being fitted out at the quay connected with their yard, and are carrying out extensive repairs to the boilers and machinery, as well as to the decks, &c., of a German steamer, which is also moored at the quay. The company are also carrying out repairs to two vessels lying in the river. The new graving dock, which will be capable of receiving ships up to 350 ft. in length, is rapidly progressing towards completion, and it is expected that very early in the New Year it will be ready for opening. It may be here mentioned that as a coal shipping centre the port of Blyth is rapidly coming to the front. To prove this, it need only be stated that the shipments of coal have increased from 146,264 tons in 1883, to 1,018,335 tons in 1888, and we believe it will be found that for the current year a further increase will be recorded. The resources of the port are being energetically developed, and it is understood that with the facilities now provided, two million tons of coal can be shipped per annum.

**Engineering.**—Though makers of marine engines continue to receive plenty of inquiries, the number of new contracts that are being actually negotiated is small when compared with what was being done in this line at the corresponding period of last year. Of course, prices are very much higher than they were then, and this circumstance is no doubt in some degree responsible for the restricted business. In the meantime the whole of the works are as busy as possible, and will probably continue so during the greater part of next year. Messrs.

Ernest Scott & Co., of the Close Works, Newcastle, are extremely busy just now on electric light machinery of all descriptions, and have in hand installations for about 20 mills in the Yorkshire and Lancashire districts, besides one for a large private house at Tenby, with petroleum engine, dynamo, and accumulators, the installation in this case being of a very complete description. In all, the firm have in hand at the present moment over 50 dynamos, of sizes varying from 25 to 700 lights. The patent oil launch engine, to manufacture which Messrs. Ernest Scott and Co. have recently obtained the licence, is being made in six sizes, from one to fifteen effective break H.P. There can hardly fail to be a great demand for these engines, which entirely obviate the necessity of using coal and the employment of stokers—they will indeed, when once started, run for a great length of time without attention. It may also be stated that they are extremely simple in construction, a merit which will no doubt be appreciated by practical men. In addition to electrical and launch engine work, the firm have now in hand four sets of marine engines, besides a number of ventilating and forced draught fans and Admiralty pumps for the Fairfield Shipbuilding Co. The extensions to the works, which were commenced during the summer months, are now about completed, and will have the effect of doubling the productive capacity. The extensions consist of a new shop for the erection of engines, dynamos, and other specialities, the dimensions of which are as follows:—Length, 92 ft.; width, 42 ft.; and height under the traveller, 30 ft. The traveller, which is worked by ropes, is capable of lifting 20 tons. The new pattern shop and drawing office, is 92 ft. long, by 30 ft. wide, and is fitted with wood working machinery of the latest type, the driving power at present being a gas engine. Messrs. R. Stephenson & Co. are now carrying out at their South Street works an improvement long contemplated, and which consists of the making of a railway connecting the iron foundry with the engineering and boiler-making departments. The improvement will also include a siding from the main line, by means of which the firm will be enabled to receive and despatch goods with much greater readiness than hitherto. At Messrs. John Abbott & Co.'s works, Gateshead, the state of business is exceedingly good. Some Colonial orders have recently been booked, chief among which are the following:—Hydraulic cage hoist for the Sydney Gas Co., to lift 60 cwt. to a height of 67½ ft.; a duplicate of one supplied six years ago; also for Sydney, eighteen 2-ton platform self-contained cranes, and two 3-ton cranes of the same type; two portable hydraulic cranes, and two 22-ton purifier cover lifts for the Melbourne Gas Co. The firm have just shipped to the Melbourne Harbour Trust two double-power hydraulic quay cranes, having 40 ft. lift, and 30 ft. rake, and have now in course of construction for the Melbourne Hydraulic Power Co. a high pressure expansion pumping engine, with double cylinders 24 in. diameter and 26 in. stroke. The engine will be capable of delivering 450 gallons of pressure water per minute against an accumulator pressure of 750 lbs. per square inch. In the foundry department work is very plentiful, among the most important contracts being one for the supply of phosphor bronze stern and stem pieces, shaft brackets, &c., for two cruisers now being built at the Elswick yard of Messrs. Armstrong, Mitchell & Co. Messrs. Black & Hawthorn have, in addition to a large amount of marine work, a plentiful supply of orders in the locomotive and general engineering departments. Messrs. Crossley Brothers, of Manchester, have, through their Newcastle agency, just supplied two of their largest type gas engines to drive electric lighting dynamos in a large local trading establishment. Messrs. Allen & Robson, the Newcastle agents of the Cowles Syndicate Co., Limited, are doing a large business in supplying the aluminium products manufactured by the company to engineering and other manufacturing firms in the district. Messrs. Dixon & Corbitt and R. S. Newall & Co., Limited, hemp and wire rope manufacturers, have a great many important orders in hand, and are utilising their extensive resources pretty fully. In the iron and steel works business is exceedingly active, and prices continue to show an upward tendency. The forges throughout the district are fully supplied with orders, principally for heavy forgings used in marine engine and ship construction.

#### THE WEAR.

**Shipbuilding.**—Among the numerous contracts in progress at the North Sands yard is a vessel ordered by Messrs. Alexander Taylor & Co., of Newcastle, which is to be 370 ft. in length, and is expected to carry about 7,000 tons of cargo.

This is understood to be the largest cargo boat yet built at this establishment. The vessel, it may be stated, is intended for the Mediterranean trade. There is also in progress of construction at this yard a large vessel which is intended for the tea trade. This vessel has, it is understood, been designed with a special view to the attainment of a high rate of speed. A very high degree of briskness is maintained in all departments of the establishment. A vessel named the *Ville du Havre* was launched from Mr. Laing's yard on the 23rd inst., and as the name indicates she will go to strengthen the fleet of a French company, to whom this well-known builder has supplied a good many vessels in former years. There are five other vessels on the stocks, one of which—a very large one—has also been ordered by foreign owners. Both Mr. Laing's graving docks are occupied with vessels undergoing repairs. Messrs. Short Brothers are engaged in carrying out extensive repairs to the ss. *Countess*, which has been in collision. The firm continue to be extremely busy with the new work in hand. Messrs. Pickersgill have, among other orders, a vessel in course of construction for Messrs. Alexander Taylor & Co., Newcastle, which is to have a carrying capacity of 5,000 tons, and Messrs. Osborne and Graham are building, for the same owners, two vessels to carry 4,000 tons each. Messrs. Pickersgill have ordered from Messrs. Crossley Brothers (through the Newcastle agency) a 20-H.P. "Otto" gas engine, to drive the machinery in their extended premises, which will very shortly be ready for occupation. Messrs. R. Thompson & Sons have the whole of their berths filled, and have still plenty of orders in reserve. The ss. *Palatino*, launched by the firm a few weeks ago, is now at Hartlepool receiving her machinery. Among the working facilities recently introduced by the firm is one of Hetherington's improved counter-sinking machines. This machine only requires the services of one workman, who need not necessarily possess any special skill, and by its use a considerable saving is effected. The machine is also on use at Mr. Laing's yard, and it is understood that the makers have orders for it from many other shipbuilders on the North-East Coast. The Sunderland Shipbuilding Co. have a large vessel nearly ready for launching, and three others in earlier stages. The company have received an order for a steamer to replace the *Marco Brunner*, launched by them for the Hansa Steamship Co., of Bremen, in August last, and which has since been lost. As the vessel is of large size, it constitutes an important addition to the work in hand.

**Engineering.**—It is understood that the North-Eastern Engineering Co., South Dock, are about to add considerably to their productive capacity, which is at present somewhat severely taxed to meet the requirements of customers. At the Palmer's Hill Works a large vessel named the *Caledonia*, built at the North Sands yard for Whitley owners, is receiving her machinery, and at the Southwick Engine Works the work of engineering the *Ville du Havre* is proceeding. The state of business at Messrs. Doxford's Works continues active. Messrs. William Allen & Co. (Scotia Engine Works) have been commissioned to carry out somewhat extensive alterations in the engines of the ss. *Countess*. The firm have a large amount of other work in hand. In the smaller engineering establishments business is still very active. Messrs. Harrison & Co., the agents for Laing's patent ring and spring, continue to receive numerous inquiries for this speciality, which is rapidly coming into favour among engineers. Two of these have recently been ordered for engines at Messrs. Bell Bros.' collieries, and not at Lord Londonderry's collieries, as stated in last month's report. A 16-H.P. "Otto" gas-engine has been put down at the new Monk Street Foundry & Copper Works, and business is very brisk at that establishment. It is understood that Messrs. Robson & Son, wooden boat builders and sawmill owners, are about to commence the manufacture of steel boats for ships.

**The Hartlepoons.**—The utmost activity still exists in the shipbuilding yards at this centre, repair work largely supplementing the new work in hand. Since the beginning of October, Messrs. Thomas Richardson & Sons have engined the following vessels:—The ss. *Glenartney*, for the well-known Glen Line of steamers. This ship has been fitted with triple-expansion engines, having cylinders 28 in., 44 in. and 72 in. by 4 ft. stroke, with two very large double-ended boilers, 160 lbs. pressure. The machinery has been inspected throughout by Mr. Roberts, superintendent engineer for the Glen Line. The ss. *Matatua*, owned by Messrs. Shaw, Saville & Co., London, with triple-expansion engines, having cylinders 25 in., 40 in., and 68 in. by 3 ft. 6 in. stroke, and two large double-ended boilers to work to 160 lbs. pressure.

The s.s. *Palentino*, owned by Messrs. Glynn, of Liverpool, fitted with triple engines, having cylinders 25 in., 40 in., and 68 in. by 3 ft. 6 in. stroke, and two double-ended boilers, 160 lbs. pressure. The following ships, engined by Messrs. Richardson, have had their trial trips in the time indicated, the result in each case being most satisfactory to all concerned:—October 2nd the s.s. *Florence*, owned by E. T. Gourley, Esq., M.P., London; October 6th the s.s. *Staffa*, owned by Messrs. Herskine & Woods, of West Hartlepool; October 9th the s.s. *Wimbledon*, owned by Messrs. Harris & Dixon, of London. This ship has had a complete and thorough overhaul of both hull and machinery. November 2nd the s.s. *Rotherfield*, owned by Frederick Woods, Esq., London; November 11th the s.s. *G. R. Booth*, owned by F. G. Greenwell, Esq., Sunderland.—At the Central Marine Engine Works of Messrs. W. Gray & Co., Limited, work is apparently as brisk as ever, the night shift being still continued. All departments appear to be working well and harmoniously together, and doing their best to assist in turning out a big year's work. It is worthy of note that it is now just seven years since it was decided by the founder of this company to build the Central Engine Works on what was then a barren waste, and during the period that has since intervened eight acres of ground have been covered with magnificent engine shops and machinery, and no less than 60 steamers have been engined with triple-expansion engines, varying from 500 to 2,000 I.H.P. Besides this, a large amount of work has been done in re-boiling old steamers, and in general repair work. No better illustration could, perhaps, be given of the rapidity with which large business undertakings are pushed forward and perfected in the present age. The local steel works keep very busy, and in the docks there is still considerable activity.

**Stockton.**—A wages dispute between the platers and helpers considerably impeded operations at this centre during the early part of the month, but the matter is now fortunately settled, and work is proceeding as usual. The following steamers, engined by Messrs. Blair & Co., have had their trial trips since October 21st:—The s.s. *Blackheath*, built by Messrs. W. Gray & Co., West Hartlepool, for Messrs. Watts, Ward & Co., of London, having engines of 190 H.P. nominal, with cylinders 23 in., 37½ in. and 61½ in. by 39 in. stroke; the s.s. *Tuskar*, built by Messrs. Richardson, Duck & Co., of Stockton, for Messrs. Farren, Groves & Co., of London, having engines of 200 H.P., with cylinders 22½ in., 37 in. and 61 in. by 42 in. stroke; the s.s. *Romola*, built by Messrs. Ropner & Son, of Stockton, for Messrs. Herskind & Woods, of West Hartlepool, having engines of 170 H.P., with cylinders 21½ in., 35½ in., and 58½ in. by 39 in. stroke. The engines for all the foregoing vessels were constructed to work at 160 lbs. pressure of steam, and on their trials were in all respects satisfactory. Messrs. Blair & Co. are at present fitting the s.s. *Gulf of Mexico*, belonging to Messrs. The Greenock Steamship Co., with a complete electric light installation—this is the ninth vessel belonging to that company in which Messrs. Blair have fitted an installation. Other engineering firms at Stockton are very busy, and some are carrying out, or contemplating, important extensions of their works.

**Middlesborough.**—Shipbuilding prospects at this important centre appear to be brighter than ever, as Messrs. Raylton, Dixon & Co., who at present have their berths completely filled, have just booked an order for six steamers of large carrying capacity. This ensures a continuance of activity in the establishment of this enterprising firm for a good many months to come. Messrs. Craggs & Sons have in frame a vessel of 2,600 deadweight carrying capacity, which is being built for Messrs. Edward Harris & Co., of Middlesborough, and have just received several other orders. Messrs. Wm. Harkess & Son have within the last few days concluded the negotiations with a foreign firm to build a good-sized steamer, and this makes, with the two vessels now on the stocks, a total of six orders in hand. The firm have just completed two important repair contracts, and continue to have plenty to do in the same line. The engineering establishments are all well employed, and some good orders have recently been booked. Messrs. Westgarth, English & Co., marine and general engineers, have work enough to keep their machinery fully going up to next September. The activity in the steel and iron works is unabated, and in the foundries a pressure of work continues to exist.

**Darlington.**—The Darlington Forge Co., Limited, have recently booked some very heavy Government orders, among which may be mentioned the crank-shafts for the engines of three of Her Majesty's first-class ironclads. These

engines are 13,000 H.P., and are being built by Messrs. Humphrey, Tennant & Co., London. Each set of engines require two triple crank-shafts, and each crank is composed of three pieces, there thus being 18 single crank shafts in all. To convey some idea as to the size of these, it may be stated that each single-crank shaft will require a 33-ton Siemens-Martin steel ingot to make it from. The company have also obtained the order for the whole of the cast steel propeller brackets required for Her Majesty's first-class battle-ships now building in the Government Dockyards at Portsmouth, Chatham, and Pembroke. The company are also busy with the two cast-steel rudders for Her Majesty's cruisers *Andromache* and *Apollo*. In addition to these important contracts, the company have had placed with them the order for the large propeller brackets required for the three new large steamers building by the Naval Construction and Armaments Co., Limited, Barrow, for the Canadian Pacific route. The company have also obtained the whole of the contracts from Martinez Rivas, Palmer & Co., of Bilbao, for the heavy steel castings, consisting of the beds, columns, pistons, cylinder covers, &c., for the three sets of engines that are to be erected in the premises they are building at Bilbao, and also the contract for the forgings required in connection with the same three sets. The company, of course, manufacture in their own works the steel required for their contracts.

### NORTH-WEST OF ENGLAND.

**Barrow-in-Furness.**—There has been no material change in the attitude of the shipbuilding and engineering trade of this district during the past month. Much activity has been maintained in all departments, and there is plenty of work in hand both for the Mercantile Marine and for the Admiralty. The great difficulty experienced, however, has been in getting plenty of supplies of steel shipbuilding material. At the Barrow yards practically all the shipbuilding material used is obtained from the Barrow Steel Works, where there are eight Siemens-Martin's furnaces, a large and powerful plate mill, angle mill, &c. There are also plate mills, &c., at the works of the West Cumberland Iron & Steel Co., and these, as well as those at Barrow, are very actively employed, and likely to remain so for many months to come. Indeed, the orders held by makers are so numerous that they do not feel disposed at present to increase their responsibilities of deliveries. There is, in fact, great need of a further development in the steel shipbuilding material plant of the district, and this is at present receiving the careful attention of the capitalists who are already identified with the trade. At the same time the deliveries of steel plates and other material to shipbuilders during the month has not been on a scale adequate to their requirements and to the rate of consumption. As a consequence of this, in several departments several men have had to be stopped who were directly waiting for material, and this led to a corresponding stoppage in other departments, which, on the whole, has been very unsatisfactory. There are, however, signs of improvement, and it is evident that in the course of a few weeks further delays will be avoided. Steel ship plates are quoted firmly at £9 per ton, and angles and channels at £8 per ton, while steel boiler plates have reached £10 per ton. These high prices have had considerable effect in checking the brisk demand for shipping which has prevailed for so long a time, but a large tonnage is still being asked for, and orders offering are alike numerous and of considerable importance both in the Mercantile Marine and the Admiralty departments. The Naval Construction and Armaments Co. have tendered for one or more first-class line-of-battle ships for Her Majesty's Government, and hopes are entertained that one or more of these important contracts will come to Barrow. It is understood that the Portuguese Government are also in the market for large cruisers and other types of war vessels. No further steps have been taken with regard to the fast Atlantic liners required by Messrs. Anderson, Anderson & Co. in connection with the Canadian Pacific Railway Co.; it is understood that the order is off for the present, although the scheme is not definitely abandoned. The details with reference to the three high-speed steamers for the Canadian Pacific Railway Co.'s Pacific route are being gradually "fixed-up" by the experts, and the preliminary work incidental to the building of these three high-class passenger ships is proceeding satisfactorily. The steamers have to be delivered in eighteen months, so that these orders alone represent a considerable activity at

the Barrow Yard, especially when it is considered that other large work is in hand, including three second-class cruisers for the Admiralty, which it is expected will be supplemented by more important contracts from the same source. The Naval Construction & Armaments Co. have delivered the Pacific line steamer *Arequipa* during the month, and her maiden voyage gave highly satisfactory results. The British & African Co.'s steamer *Boma* has also been delivered, and a small steamer, the *Ida*, for Messrs. Lamport & Holt. A second new steamer for the British & African Co., the *Matadi*, left for Liverpool on Sunday, November 23rd; and on Saturday, the 22nd, a sister ship to the *Matadi* was launched from the Naval Construction & Armaments Co.'s yard, named *Soudan*, built along with another steamer, now on the stocks, for Messrs. Elder, Dempster & Co., of Liverpool. There is great activity in the engineering and boiler-making departments of local shipyards, and a good prospect is offering for a busy future.—The new firm of Westray, Copeland & Co. has been registered as engineers, boiler-makers, ironfounders, &c., with Mr. C. J. Copeland as managing director, and an influential directorate. This firm, under Mr. Copeland's management, has done some important work in the repairing of and putting new triple-expansion engines into Red Star Line steamers, and the most satisfactory results are recorded of the performances of the *Lisbonense* and the *Paraense*, which steamers have been refitted by this firm. There is good scope at Barrow for these works in the repairing of steamers, and in important marine engine work. There is plenty of graving dock and dock accommodation generally, good powerful steam and hydraulic cranes, and admirably fitted up workshops.

**Whitehaven.**—The shipbuilding company at this place has practically closed its gates. The company has delivered to the owners the new steel ship *Engelhorn*, and there is now no work in the yard. The directors of the company have offered the works for sale. The works are admirably situated for the building of steel sailing vessels, being in close proximity to the West Cumberland Plate Mills.

**Isle of Man.**—The Isle of Man Steampacket Co. are reported to have placed the order for a powerful high-speed screw passenger steamer with the Fairfield Shipbuilding Co., and it is said they intend to dispose of either the *Prince of Wales*, the *Mona's Isle*, or the *King Orry*. The new steamer is to have triple-expansion engines of great power; to be economic in coal consumption, and is to be the forerunner of a fleet of fast screw boats in this trade. There is no new information in reference to the proposal to build three fast passenger screw steamers for a new Isle of Man Steamship Co. The probability is that the order for these will not be given this year.

**Maryport.**—Messrs. Retson & Co., Shipbuilders of Maryport, are at present engaged in the construction of a four-masted iron ship, and a large barque, and the re-classing of a large ship *Narcissus*, of Greenock.

### THE MERSEY.

**I**N all departments of marine engineering, works both at Liverpool and in other Lancashire centres, are pressed with orders of every description, but considerable difficulties are still experienced in obtaining the requisite supplies of raw material, whilst the men display so restless a disposition, not only with regard to wages, but on questions of overtime, outdoor allowances, and other matters which usually crop up directly there is any briskness in trade, that employers in many cases are questioning whether they are obtaining any really substantial advantage out of the improvement in trade. In the Liverpool district the men are assuming a very determined attitude upon the question of overtime, demanding rates of payment considerably in advance of what they have hitherto been receiving, and this is causing considerable difficulties at some of the works. As we pointed out in a previous report, the conditions now surrounding trade cause so much uncertainty with regard to the future that both shipbuilders and engineers are compelled to be very cautious as to how they commit themselves to forward engagements, and this is inevitably having a detrimental effect upon the prospects of trade. To some extent possibly it may be due to unwillingness of shipbuilders in this district to contract very far ahead in the construction of vessels, and partly to the largely increased cost of shipbuilding, owing to the great rise in the price of both material and wages; but the general result is that a number of orders for ships which would in all probability have been placed with English builders are being

given out abroad, not only in France, but also in Germany, and there is no doubt that the position in which English shipbuilders are now placed will greatly assist foreign firms in competing successfully for the business that is coming forward. With regard to marine engineers in the Liverpool district, we have made special calls upon the leading firms, and the reports received, without exception, are that they are full of work for a considerable time ahead. Messrs. Fawcett, Preston & Co. Limited, of the Phoenix Foundry, Liverpool, have in hand a number of orders for marine engines, and they are also busy in all descriptions of engineering work. They are just completing a set of triple-expansion engines, with cylinders 27 in., 44 in., and 71 in. diameter, with 48 in. stroke for the *Indrapura*, a vessel which is being built by Messrs. Thomas Royden & Son, of Liverpool. These engines are similar to others which have been supplied to several other steamers built by Messrs. Royden, and they will develop about 1,800 to 2,000 H.P. Another set of triple-expansion engines, with cylinders 29 in., 46 in., and 74 in. diameter, and 48 in. stroke, is also being constructed for Messrs. Royden, to be placed upon a steamer that is being built for Messrs. R. Singlehurst & Co. These engines are to develop from 2,300 to 2,400 H.P., and the boilers, it may be added, are being constructed to stand a working pressure of 175 lbs. to the square inch. A third set of engines which, however, are of the ordinary compound type, with cylinders 22 in. and 55 in. diameter, and 40 in. stroke, are also being erected for Messrs. Royden, for a vessel which they are building for Mr. Alfred Holt, the power to be developed by them being from 1,000 to 1,200 horse. These engines are to be worked by a forced draught on the closed stoke-hole system, and the fan engine is being made by Messrs. G. & H. Gwynne. Another set of compound engines, also for a vessel being built for Mr. Alfred Holt by Messrs. W. H. Potter & Co., of Liverpool, is in hand, with cylinders 21½ in. and 46 in. diameter, with 8 ft. stroke, to develop from 700 to 800 H.P.

In another branch of their engineering work the firm have just completed a plant of Chapman's Patent Self-Adjusting Multiple Effect Evaporating Apparatus, which is being erected at Sunderland, and is on somewhat the same principle as the evaporating plant constructed by the above firm at Suakim during the Egyptian War. The apparatus has, however, since then been considerably improved, and instead of requiring constant watching, is now practically automatic in all its operations. This plant, so far, has been erected chiefly for sugar works and for other works' requirements, but the system is especially applicable for steamships, and the firm are now turning their attention to designing a plant in such a way as to be placed on board ship; but we must reserve a further detailed description for subsequent notice. Daniel Rolls & Sons, of Sandhills, Liverpool, are extremely busy both in their engineering and boiler works, and they have a considerable amount of orders in hand for the conversion of ordinary compound into triple-expansion engines. In fact, it may be said that the alteration of engines in this direction is going on to a very large extent generally. J. H. Wilson & Co. are very busy on orders for their improved steam winches, which they have recently introduced. These are designed for use chiefly on board steamers and large sailing vessels, and they have just booked an order for 60. They have also fitted them to the *Teutonic*, and to many of the Transatlantic boats, whilst they are also supplying them to Belgian and French shipbuilders as well as pretty generally throughout the trade. These winches are fitted with double cylinders and link reversing gear, with warping ends on the two extremities of the barrel shaft, and whipping drums on the intermediate shaft. They are also provided with a single and double purchase hoist gear, and all the parts, which are carefully fitted, are easy of access for repairs, whilst the steam chest covers are so arranged that the valves can be examined without disturbing the pipe joints. All the parts are interchangeable, and the frames and cylinders are reversible. Messrs. Grayson & Co., of Sandhills, are also busy with repairs and overhauls, the *City of Rome* having just been laid up after the season for a complete overhaul, which will occupy the next two or three months, and Messrs. George Forrester & Co., of the Vauxhall Foundry, Liverpool, have a number of important orders in hand for engines to be supplied to steamers now in course of building.

**Manchester.**—In the Manchester district the various engineering firms who are engaged on heavy tools and plant for marine engineering establishments have a very large weight of work of this description in hand, and Messrs. Hume & Co. of the Ordsal Engineering Works, Salford, have been com-

pelled to carry out a considerable extension of their establishment, in order to meet the requirements for their special types of marine tools, of which we shall be able to give some detailed notice in a future issue. Messrs. James Spencer & Co., of the Chamber Iron Works, Hollinwood, near Manchester, have in hand for the Central Marine Engineering Co., West Hartlepool, an exceptionally powerful planing machine, which is being specially built to meet the particular requirements of the above works. This machine is provided with two tables which are driven by rack and pinion with a massive helical toothed wheel about 4 ft. diameter, gearing into a rack underneath the table. The machine can be operated from either side as desired, when both tables are working together. When tables are working separately, each table is operated independently from its own side. The machine is constructed to plane 20 ft. long, 7 ft. 6 in. wide, and 6 ft. high. It carries two tool boxes with cross slides and one large upright. Each tool box has self-acting motion and the machine is so arranged that it will plane three sides at one setting. The machine is made specially strong in all its parts and there is very powerful gearing throughout, to give sufficient strength for cutting wrought iron and steel. The total weight of the machine is about 35 tons. Messrs. Spencer have recently completed, also for the Central Marine Engineering Co., a specially designed over-head travelling crane which is now fixed and working in one of their principal shops. This crane is driven from a square shaft running the full length of the ending shop, 55 ft. open from centre to centre of the rails with very massive wrought-iron girders and carriages. All the motions for hoisting and lowering travelling and longitudinal travelling are controlled by one man, from a platform attached to the crab in such a position as to command an uninterrupted view of the lifting hook at all times. The various motions are put in operation by cone friction clutches with all the hand wheels brought within easy reach of the man who works the crane without his having to change his position. The lowering is controlled by power, aided by a very powerful brake, which is operated from the same position as the other motions. The gearing throughout the crane is of cast-steel with a very large margin of strength for the work it is intended to do. The barrel is 3 ft. 6 in. in diameter, and of such a length that with one lap it will give the required lift, with right and left-hand grooves turned out of the solid for a steel wire rope instead of a chain. There are eight ropes to take the load with a total breaking strain of 600 tons. The top and bottom block pulleys are of large diameter and turned in the grooves for the rope. There are six speeds for hoisting and lowering and three speeds for the cross travelling and longitudinal travelling motions, the various changes in the gear being effected from the position where the attendant sits when at work. The total weight of the crane is over 60 tons, and it is constructed to deal with loads up to 50 tons with a very large margin of power and strength; above this the crab itself weighs over 20 tons and the snatch is over two tons in weight. With respect to this crane it may be interesting to add that the manager of the company has written to Messrs. Spencer that after having had the crane at work for several months, he is glad to be able to say that he considers it a splendid job, both in design and workmanship, and that he regards it as one of the best over-head cranes he has ever seen anywhere.

In the iron market, although prices have been fluctuating to some extent during the month, the general tendency has been steadily upwards, and all descriptions of material required for marine work or shipbuilding purposes are decidedly dearer, with every indication that prices have not yet at all touched their highest point. Local and district brands of pig iron are not obtainable under about 71s. 6d. to 72s. 6d. less 2½, whilst Middlesbrough iron is quoted at 73s. 4d. to 73s. 10s. net cash delivered equal to Manchester, and Scotch iron at about 70s., for Eglington to 72s. 6d., for Glengannock delivered at the Lancashire ports. In manufactured iron prices are also tending upwards, although they have not advanced to the same extent as the raw material. Makers, however, are all heavily sold and decline to commit themselves to contracts for long forward delivery. For present actual specification bars are firm at £7 15s. to £8 per ton, and 5s. above this figure has been paid on contracts over the first three months of next year. Steel ship-plates delivered ex-steamers at Liverpool are now quoted at £10 10s., and angles at £9 10s. per ton with business having been done at these figures. Steel boiler-plates delivered ex-steamers at Liverpool would not be obtainable at anything under £11 10s., or even £11 15s. per ton.

In metal goods all descriptions of steam fittings continue to move upward in price, and there have been two advances on list rates during the past month. Solid drawn brass boiler tubes delivered equal to Manchester or Liverpool are now quoted at 7½d. per lb., solid drawn brass surface condenser tubes 8½d., solid drawn copper tubes 9½d., braised copper steam tubes 9½d., yellow metal condenser plates 6d., brass wire 6½d., copper wire 8½d., cast composition wheel nails and spikes 7½d., ditto red metal 9½d., wrought copper rivets and workers 9½d., wrought copper boat nails from 9½d. to 10½d. according to sizes, copper sheets 10d. per lb., copper bolts £62 per ton.

In the timber trade imports of most articles have recently been in excess of requirements, and notwithstanding a satisfactory demand and large delivery, stocks have accumulated, these in most cases being now heavy.

## WELSH NOTES.

THE chief topic of conversation in this district at present is the result of a Board of Trade inquiry into the loss of the s.s. *Zephyr*. The summing up of the Court reminded one more than anything else of the late Mr. Rothery in his palmy days. It appeared as though the men forming the Court looked at the matter something like this:—"Here we have an old steamer which Mr. Plimsoll saw overladen two months since; a month later she goes to sea and is lost: under such circumstances the owner must be to blame." A ridiculous way of looking at the matter no doubt, but yet the only one. The vessel was said to be overladen on her last trip but one, and the owner at once discharged as much cargo as would enable her to go to sea with the "side" the Board of Trade said she should have next voyage she loaded, actually a few tons less than the Board has previously passed, yet the Court found that whilst she was not overladen, she was loaded quite deep enough, and, further, that after all she was perhaps overladen, because the tables by which her freeboard was assigned were meant only for vessels of the highest class. Then fault was found with the position of the ventilators on the fore-deck, notwithstanding that they have been in exactly the same position when the boat was engaged in the passenger trade, and when she had been surveyed and passed by the Board of Trade officials time after time. It was apparently necessary to find a scapegoat, and the unfortunate owner of the *Zephyr* was cast for that part.

A certain amount of commotion has been caused at Swansea by the action of a section of the local harbour trust in connection with the appointment of a new solicitor and clerk to the trust. The most objectionable feature in the whole business is perhaps the manner in which Sir Hussey Vivian lectured his co-trustees, men quite as intelligent and quite as able as himself. His example was followed by a young solicitor from London, who is a nominee of the Duke of Beaufort. If the ill-feeling raised has only the effect of upsetting the present unfair and unbusinesslike manner in vogue for the election of Swansea Harbour Trustees it will do an immense amount of good.

"Got any warrants?" is the question one is constantly hearing amongst metal men in Wales. They are all dabbling in iron, and some of them have done remarkably well, the danger, however, is that they will not know when to stop, and so be "had" when the drop does come, for the present highly inflated prices for Scotch iron cannot last.

We understand that tin is a good purchase just now. It will not secure many speculators in this district, for it is too big a thing for small men, who can, however, all afford a little gamble in iron. Copper, lead, and spelter are also all spoken well of.

It is announced that considerable improvements are about being made at Barry Dock. At present there are only facilities for an export trade, but a new import dock is to be constructed. In addition a commercial dry dock is to be constructed, and we should say that the sooner this work is proceeded with the better. That an anti-monopoly dock should be constructed, and yet the cream of the ship repairing trade be left in the hands of a coterie, is one of those things about Barry calculated to strike the stranger with surprise. In addition to these alterations at Barry, it is reported that new fuel works on an extensive scale are about being erected.

Referring to the war of rates between the Taff Vale and Barry Companies, a letter has recently appeared in a local daily, giving some interesting particulars as to the profits of the local coal

shippers through this cutting of rates. Thus the recent deductions mean to the Ocean Coal Co. a saving of £16,000 per annum; to the Ferndale Co., £15,000; Glamorgan Co., £10,000. It is interesting to note that the company receiving the most is the one with which the vice-chairman of the Barry Co. is intimately connected. Add this fact to the Barry Dry Dock monopoly, and one can see very easily who are in the best position in connection with Barry.

Some headway is being made with a scheme for improving the navigation of the Severn. The scheme at present before the public here is to dredge that river, between Gloucester and Worcester, to a minimum depth of 10 ft., to enlarge the locks *en route*, and to construct a dock at Worcester. It is estimated that the cost of this will amount to some £25,000. The Worcester and Cardiff Corporations have each contributed towards the Parliamentary expenses £500, and towards the carrying out of the scheme £5,000. There can be no doubt that should the scheme be successfully carried out, it would benefit the port of Cardiff. At a recent meeting of the Local Chamber of Commerce it was stated that several local traders, who had for some time shipped hardware, pottery, and other goods from the Midlands and Cardiff, had been compelled, by high railway rates, to send their goods *via* Liverpool, to which port they could secure cheaper railway carriage than to Cardiff. If, however, this Severn navigation scheme were carried out, then these merchants would once more be able to ship their goods at Cardiff, for the rate by water to that port would be only 14s. as compared with a railway rate of 25s. to Liverpool.

It is stated that the Bute people are about sinking two new pits near Pontypridd, and that other well-known people are also preparing to start new collieries. Within the next few months it is quite probable that as many as a dozen new colliery enterprises will be commenced in the Rhondda Valley district.

For some time past there has been a dispute with the boilermakers at the ship repairing yard of Messrs. Mardey, Carney & Co., Limited, of Newport. For a considerable time the firm have been employing carpenters to do all the ship repairs they needed. The boilermakers naturally did not like this, but bore with it for some time. At length, however, they refused to do any work whatever for this particular firm, unless all the ironwork was given them. Of course the directors of the ship-repairing firm at once set about securing the services of non-society boilermakers, but almost as fast as these men are imported they are either persuaded to join the society, or else paid a more or less handsome sum to leave the town—one man, we heard, was paid as much as £30 to clear out. Whilst we naturally feel a desire that masters should be permitted to carry on their business in their own way, it cannot be desired that if other ship-repairers in Wales employ only society boilermakers to do their ironwork, the society should do all in its power to protect them against the competition of any stray employer who employs another class of men to do similar work on more advantageous terms. For this reason, and for this reason only, we feel bound to admit, that our sympathies are with the men who are fighting, not only their own battle, but that of the majority of Welsh ship-repairers.

During the past month there has been another bad experience of Welsh bunker coal. A steamer left one of the Bristol Channel ports with about 200 tons of what purported, according to the charter, to be good bunker coal, and for which 13s. 6d. had been paid. She got as far as St. Ives, whence the master wired his owners for instructions. The instructions were that he should put back to the nearest Welsh coal port and take in a fresh supply of bunkers. Before this was done a careful trial was made of the coal by an engineer and staff of firemen appointed by the shipper, with the result that it was found impossible to keep up the necessary pressure for more than an hour at a time. Of course there will be an action before one of the Courts, and equally of course there will be more hard swearing as to what really constitutes good Welsh bunker coal. There are people who appear to think that any rubbish, so long as it be black, answers this description.

The tinplate trade promises well at present. Stocks are very low, prices are going up, and no makers of any importance will sell forward for any lengthened period except at a considerable advance on present prices. How long this feeling will continue remains to be seen, for there are no manufacturers on the face of the earth so unstable as the tinplate manufacturers of Wales.

The coal trade has recovered from the slump of October, and the faces of shippers are not nearly so long as they were during that month. Of course the miners are, as usual in times such as these, prepared to cry for the moon, and know not exactly what they want. Their leaders must be having a fine old time of it.

### BELFAST TRADE NOTES.

THERE is still the same activity in the shipbuilding and engineering trade here, and no prospect of any diminution of this happy state of affairs.

Messrs. Harland & Wolff have finished the s.s. *Narab* for the Asiatic Steam Navigation Co., Liverpool, and have launched another steamer, s.s. *Nadir*, for the same owners, and at the same time have in hand the s.s. *Majestic*, while two more vessels are almost ready for launching.

The Castle Steel Foundry, Middlesborough, have received an order from Messrs. Harland & Wolff for 13 steel stern frames, some of them of very large size.

The fine steamer *Queensmore*, built by Messrs. Harland & Wolff, and which only left here within the past few months, has been burnt on her maiden voyage; she was owned by Messrs. Johnston, Liverpool.

Messrs. Workman, Clark & Co. still continue busy, and had the s.s. *Jane Clark* in hand for some slight repairs received by collision in Belfast Lough.

Messrs. McIlwaine, Maccoll & Co., Limited, launched a fine steamer, the *Mount Hebron*, to the order of Messrs. Smith & Service, Glasgow; this is the largest vessel yet built by them, and has been finished very rapidly. The s.s. *Andes* is now almost ready for sea, after receiving compound engines and boilers, and a thorough overhaul to the hull.

Messrs. Victor Coates, Princes Dock Works, had the s.s. *Teeling Head* in hand for repairs.

The new 100-ton crane erected by Messrs. Taylor, Birkenhead, has been tested, we understand, satisfactorily different times during the month. An addition has been made to the line of steamers owned by Messrs. Polgrave, Murphy & Co., and trading between Belfast, Dublin, &c., and the Continental ports, by the purchase of the s.s. *Tudor*, Liverpool, by them.

### LEITH NOTES.

SEVERAL launches have taken place here this month, and considerable activity exists at all the yards. New orders continue to come in, and a prosperous New Year is guaranteed. Messrs. Ramage & Ferguson have received an order for a new steamer for Messrs. Currie & Co.'s Continental fleet, and Messrs. S. & H. Morton have received a like order. The first-named firm have at present on hand eight vessels, and the latter three.

Several trial trips have taken place in the Forth during the month, amongst them the steamers *Rex* and *Barracough*, built by Messrs. Ramage & Ferguson; the steamer *Gaderen*, built by the Grangemouth Dockyard Co., and a small lighter, launched by Messrs. Hawthorns & Co., for the Admiralty; the last-named firm also launched another lighter for the Admiralty on the 8th inst., and have at present two similar craft approaching completion.

Messrs. W. B. Thomson, Limited, Dundee, launched at the end of last month a magnificent steel steamer built on the cellular system, and of a gross tonnage of 3,500 tons. The launching ceremony was performed by the Marquis of Lorne. This is the fourth steamer built for the Clyde Shipping Co. by this firm, and they have at present other two under construction, one a twin-screw steamer of 800 tons, and the other a steamer of 1,100 tons for the general cargo trade.

The Grangemouth Dockyard Co. launched at the beginning of the month a handsome steel barque of 700 tons register for the teak carrying trade. The joiners employed in the above yard have received an advance of ¼d. per hour. They have now 7½d. per hour.

The foundation-stone of the Edinburgh Exhibition of 1890 has been laid by Lady Clark, wife of Sir Thomas Clark, Bart., ex-Lord Provost and Chairman of the last Edinburgh Exhibition.

The new lighthouse, which has been under construction for some time back, on the island of Inch Keith, has now been completed, and though not so high from sea-level the light is more brilliant. It will be remembered that a large steamer got on this island two months ago, and became a total wreck.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES—ENGLISH.

**Pioneer.**—On Tuesday, October 15th, Messrs. Forrest and Son, of Norway Yard, Limehouse, London, E., and the Shipyard, Wyvenhoe, Essex, launched from their Wyvenhoe yard, a side-wheel steamer called the *Pioneer*, for missionary service on the Upper Congo. Her dimensions are 60 ft. by 10 ft. by 3 ft. 3 in. She is built throughout of galvanised steel, and is fitted with teak cabins.

**Ringwood.**—On October 24th there was launched from the Howdon yard of Messrs. Palmer's Shipbuilding and Iron Co. a vessel of the following dimensions:—Length, 210 ft.; breadth moulded, 30 ft.; depth, 14 ft. The steamer on leaving the ways was christened the *Ringwood* by Mrs. Henderson, wife of Captain Henderson, North Shields. The *Ringwood* is about the fortieth ship built by the Palmer Co. for Messrs. John Fenwick & Son, of Newcastle and London.

**Western Belle.**—On October 24th there was launched from the shipbuilding yard of Mr. W. Shilston, at Plymouth, a new three-masted schooner, to register about 145 tons, and to class A 1 at Lloyd's. She was named the *Western Belle* by Miss A. Shilston, daughter of the builder, and will be fitted out by him for his own use.

**Matatua.**—On October 24th there was launched from the shipbuilding yard of Messrs. Robert Stephenson & Co., Limited, at Hebburn, a spar-decked steel screw steamer of the following dimensions:—Length, 340 ft.; breadth, 41 ft. 3 in.; depth, 28 ft. 11 in. This is the third vessel constructed at this yard for Messrs. F. Stumore & Co., of London. Throughout the vessel's length is a double bottom for water ballast, constructed on the cellular principle. The deck and other fittings are of the most improved type. The propelling machinery consists of a set of triple-expansion engines of about 1,800 I.H.P. The vessel was named the *Matatua* by Mrs. M'Dougal, wife of Captain M'Dougal, who will take command of the ship.

**Steel Screw Steamer.**—On October 24th there was launched from the shipbuilding yard of Messrs. Harvey & Co., Limited, Hayle, a beautifully-modelled steel screw steamer, built to the order of Mr. T. W. Richardson, of London, and from the specifications and under the inspection of Mr. T. A. Adamson, M.I.C.E., consulting engineer and naval architect, Leadenhall-street, London, E.C. She is intended for the China coasting trade, and her dimensions are:—Length between perpendiculars, 266 ft.; beam, extreme, 36 ft. 6 in.; depth of hold, as for Lloyd's, 16 ft. 7 in. Her carrying capacity is about 2,100 tons deadweight. She is to be rigged as a two-mast schooner, and is constructed on the cellular bottom system throughout for water ballast, has a spar-deck, raised bridge, on which will be the chart and wheelhouse, with flying bridge above. The saloon will be underneath the bridge. A fore-castle deck will be forward, with berths for the crew, and a shade deck aft, with comradore's house underneath. She will be splendidly fitted up in every part with the most modern improvements. Her engines, which are also supplied by Messrs. Harvey & Co. Limited, are tri-compound, of 1,100 I.H.P. The high pressure cylinder is 21½ in. diameter, medium pressure cylinder 33 in. diameter, low pressure cylinder 56 in. diameter, with a stroke of 39 in. She will be fitted with steam starting, reversing, and turning engine. Steam is supplied at a pressure of 160 lbs. per square inch by two steel boilers, each 13 ft. 6 in. in diameter, and 10 ft. long, fitted with six of Purvis's patent ribbed flues. In addition to the usual mountings, a Gilmour's patent feed heater and water circulator is fitted, and a Gilmour's patent evaporator and winch condenser, the latter being a novel contrivance for supplying the boilers with fresh water for auxiliary feed instead of sea water. The steamer is intended for passenger service on the coast of China. Provision is made for supplying the passengers with drinking water, one of Hocking's patent condensers being fitted for supplying 600 gallons of fresh water per day from sea water. She is also fitted with two steam winches, steam steering gear, and patent steam windlass, which can be supplied with steam from main or winch boilers, the connection being made with an Auld's patent reducing valve.

**Culgoa.**—On October 25th Messrs. Joseph L. Thompson & Sons launched from the North Sands Shipyard, Sunderland, a steel steamer of about 3,400 tons register, having a dead-

weight capacity of 4,500 tons. This vessel has been built to the order of Mr. William Lund, of London, and is intended for the Australian line, for which service the *Hubbuck* and *Murrumbidgee* were also built by Messrs. Thompson. She is built on the three-deck rule, having also long full poop and top-gallant fore-castle, and will be classed in the highest classification of Lloyd's. The vessel will be fitted for a limited number of first-class passengers. The engines are being built by Messrs. T. Richardson & Sons, of the triple-expansion type, and are expected to indicate 2,000 H.P. The ceremony of naming the vessel *Culgoa* was performed by Mrs. William Lund, wife of the owner.

**Alderley.**—On ——— there was launched from the shipbuilding yard of Messrs. Palmer's Company, at Jarrow, a fine steel screw steamer of the following dimensions:—Length, between perpendiculars, 320 ft.; breadth, 42 ft.; and depth, moulded, 28 ft. The vessel will be rigged as a two-masted schooner, and is built to class 100 A at Lloyd's. She is of the three-deck type, with short poop, bridge amidships (covering machinery space), and topgallant fore-castle. The vessel will load about 4,600 tons deadweight on Lloyd's freeside. As the vessel left the ways she was named the *Alderley* by Mrs. F. B. Ross, of Alderley Edge. The *Alderley* has been built to the order of the Tapscott Steamship Company, of Liverpool.

**Steel Steamer.**—On October 26th Messrs. Newall & Co., of St. Philip's Iron Works, Bristol, launched a steel steamer for the fruit trade on the River Plate, of the following dimensions:—125 ft. by 26 ft. by 9 ft. 6 in., built under Lloyd's special survey. This vessel will be fitted by the builders with triple-expansion engines and steel boiler of their own make, working at 150 lbs. pressure, and indicating 320 H.P.

**Alcyone.**—On October 26th Messrs. W. H. Potter & Sons launched from their shipyard, Queen's Dock, Liverpool, a large sailing ship of the following dimensions:—Length, 266 ft. between perpendiculars; beam, 41 ft.; depth of hold, 24 ft. 6 in.; tonnage (nett register), about 2,190; deadweight capacity, 3,400 tons. Upon leaving the ways the vessel was named *Alcyone* by Miss Dora Chambers. The *Alcyone*, which is a sister ship to the *Seafarer*, built and owned by Messrs. Potter, has been built to the order of Messrs. Boyes & Ruyter, Bremen, and has taken the highest class in English and German Lloyd's.

**Raisby.**—On October 26th Messrs. Ropner & Son launched from their North Shore Shipyard, at Stockton, a steel screw steamer, built to the order of Messrs. Ropner & Co., of West Hartlepool. Her dimensions are as follows:—Length over all, 282 ft. 6 in.; breadth, 38 ft. 10 in.; depth, moulded, 21 ft. 11 in. She has been built to the highest class at Lloyd's, and is designed to carry 3,300 tons deadweight. Being built on the web-frame principle, her holds will give large stowage for cargo. Emerson, Walker & Co. supply the windlass. She will be fitted with high expansion engines by Messrs. Blair & Co., Limited, of 900 I.H.P., and two large steel boilers working at 160 lbs. She was named *Raisby* by Mrs. John Ropner, of West Hartlepool.

**Fonar.**—On October 26th Messrs. Wigham, Richardson & Co. launched from their Neptune Works, on the Tyne, a steel screw steamer, built for the Manchester and District Shipping Co., to the order of Messrs. George Tweedy & Co., for which firm the builders have already constructed seven vessels. The vessel was named the *Fonar* by Miss Tweedy. She is classed 100 A 1 special survey at Lloyd's on the spar-deck rule, with poop, bridge, and fore-castle; and will carry nearly 6,000 tons measurement of cargo, besides nearly 300 tons of bunker coal. She has about 1,000 tons of water ballast in deep tanks available for cargo or bunker and under the tunnel, according to Christie's patent, as well as in the engine-room. The masts are constructed in such a way as to make the steamer suitable for the Manchester Ship Canal. The engines have also been constructed by the same builders, and are of the quadruple-expansion type (Tweedy's patent). She is fitted with patent horizontal direct steam windlass by Emerson, Walker & Co.

**Krim.**—On October 26th the Messrs. Blyth Shipbuilding Co., Limited, of Blyth, launched from their building yard a fine specimen of the modern cargo steamer. This vessel, which has been built to order for Norwegian owners, through Messrs. Rile & Co., of London and Newcastle, is 260 ft. long; by 36 ft. 6 in. broad; and 19½ ft. deep, and has been constructed of steel to Lloyd's highest class, on the cellular bottom principle for water ballast, with web frames, &c. Her deck arrangements consist of a long raised quarter-deck and poop, also long

bridge extending to foreside of foremast. The captain and officers' accommodation is in a handsome saloon aft, below poop deck, while the engineers are comfortably provided for in neat cabins amidships. The vessel has been built to comply with the Board of Trade requirements for carrying grain in bulk. There are powerful winches by Messrs. J. Smith & Sons, of Newcastle, to each hatch for the rapid loading and discharging of cargo; and Emerson's patent windlass is placed on fore-castle deck. The steering arrangements consist of a compact hand and steam steering gear by Messrs. Donkin & Nichol, fitted up in wheelhouse over the bridge, and there is a screw gear aft. The engines are of the triple-expansion type, with cylinders 20 in., 33 in., and 54 in. by 36 in. stroke, and 160 lbs. ordinary working pressure, and will be supplied by Messrs. Black, Hawthorn & Co., of Gateshead-on-Tyne. As the vessel left the ways she was gracefully named the *Krim* by Mrs. John Nixon, of Blyth.

**Tunbridge.**—On October 30th Messrs. Raylton, Dixon & Co. launched from their Cleveland dockyard a steel screw steamer, which has been built to the order of Messrs. Temperley & Co., London and Newcastle. She is built with "partial awning deck," that is, having bridge and fore-castle connected continuously, and is of the following dimensions:—Length, over all, 307 ft.; breadth, 40 ft.; depth, moulded, 21 ft. 4 in., with a carrying capacity of 3,600 tons. Her engines will be fitted by Messrs. T. Richardson & Sons, of 190 H.P. nominal, with cylinders 22 in., 35 in., 57 in. by 39 in. stroke. On leaving the ways the vessel was christened *Tunbridge* by the Misses Isabel and Minnie Simpson. The vessel has been built under the supervision of Mr. William Whyte, of Newcastle, inspecting engineer for the owners, and she will be commanded by Captain John J. Johnson, of North Shields.

**Moness.**—On November 4th, at the shipbuilding yard of Messrs. John Readhead & Sons, South Shields, a steel screw steamer was launched, of the following dimensions, viz.:—Length, 290 ft.; breadth, 39 ft.; and depth, moulded, 21 ft. 8 in. The vessel is of the improved well-deck type, and built to class 100 A 1 at Lloyd's, under special survey. Her deadweight carrying capacity is about 3,500 tons. The machinery is also built by Messrs. Readhead & Sons. The steamer has been built to the order of Messrs. MacLean, Doughty & Co., of West Hartlepool. On leaving the ways the vessel was named the *Moness* by Mrs. MacLean, wife of one of the managing owners.

**Orange Prince.**—On November 4th there was launched from the Walker Shipyard of Messrs. Sir W. G. Armstrong, Mitchell & Co., a steel screw steamer of 2,700 tons deadweight capacity. The vessel has been built to the order of Mr. James Knott, Newcastle-on-Tyne, and on leaving the ways was named the *Orange Prince* by Miss Teale, daughter of Dr. Teale, of Scarborough. The vessel is built on Swan's patent principle for the carriage of petroleum in bulk, and will have Veritas' highest class. Immediately after the launch the *Orange Prince* was taken to the works of the Wallsend Slipway & Engineering Co., where she will be fitted with machinery on the triple-expansion principle.

**Zweana.**—On November 6th, at Messrs. John Blumer & Co.'s shipbuilding yard, North Dock, Sunderland, the iron screw steamer *Zweana* was launched. The vessel is of the following dimensions:—Length, 242 ft.; breadth, 34 ft.; depth, moulded, 19 ft. 6 in.; and has been constructed to take the highest class at Lloyd's and Board of Trade certificate. The vessel, which is built to the order of the Mersey Steam Shipping Co., Liverpool, has accommodation for 30 first-class passengers under full poop. There is also spacious accommodation for a number of second-class passengers and the officers under fore-end of poop. The engines are constructed by Mr. George Clark, Southwick, with cylinders 20½ in., 33 in., 54 in., and 39 in. stroke, double-ended steel boiler working at a pressure of 160 lbs. The vessel was named by Mrs. Ernest Forwood, London.

**Sheerness.**—On November 6th Messrs. Richardson, Duck & Co. launched from their building yard, at South Stockton, an iron screw steamer of the following dimensions, viz.:—Length, over all, 287 ft.; breadth, extreme, 37 ft. 5 in.; depth of hold, 20 ft.; gross tonnage, about 2,080 tons. The vessel, which has been built for Messrs. G. R. Sanderson & Co., of Hull, is classed 100 A 1 at Lloyd's. She is of the raised quarter-deck type, with a short poop, and a long bridge extending to the stem; and has a double bottom on the cellular principle for water ballast, in the after and main holds, and under the engines and boilers. She will be fitted with four steam winches,

steam steering gear, stockless anchors, and all the latest improvements for facilitating the loading, discharging, and manœuvring of the vessel. Her engines are by Messrs. T. Richardson & Sons, of Hartlepool; cylinders, 21 in., 35 in., and 58 in. by 36 in. stroke. As the vessel was leaving the ways she was gracefully christened *Sheerness* by Miss Sanders, of Geenholme, Stockton-on-Tees.

**Norsa.**—On November 6th Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer, built to the order of Messrs. Herskind and Woods, of this port. This vessel will take Lloyd's highest class. Her dimensions are:—Length, over all, 285 ft.; breadth, 37 ft. 2 in.; depth, 21 ft. 10 in., with a poop aft, a raised quarter-deck, a long bridge to the fore-hatch, and a topgallant fore-castle. The saloon and cabins are aft, the engineers' rooms amidships, and the crew's accommodation in the bridge forward. The hull is built on the web-frame system. Large hatchways are fitted, four steam winches, steam steering gear amidships, screw gear aft, patent donkey boiler and patent windlass, boats on beams overhead, two masts with fore and aft rig, and all modern working appliances will be fitted for general trading. The Central Marine Engine Works of the builders supply fine triple-expansion engines, having cylinders 21½ in., 34 in., and 57 in. diam., with a 39 in. piston stroke, and two large steel boilers to work at 160 lbs. pressure per square inch, fitted with Fothergill's patent system of forced draught, which, judging by the past results of the application of this system, is expected to give great efficiency and economy. She was gracefully christened *Norsa* by Miss Moore, of Harrogate. Captain Peterson has superintended the building of the vessel, while the machinery has been constructed under the superintendence of Mr. J. R. Fothergill.

**Tordenskjold.**—On November 7th there was launched from the yard of Messrs. T. & W. Smith, North Shields, a steel screw steamer of the following dimensions:—225 ft. by 32 ft. 6 in. by 15 ft. She will be engined by the North-Eastern Marine Engineering Co., triple-expansion cylinder, 16½ in., 27 in., and 44 in. by 33 in. stroke. Boilers, 160 lbs. pressure. She was named *Tordenskjold* by Mrs. Eustace Smith, the wife of the builder.

**Zoe.**—On November 7th Messrs. Thomas Turnbull & Son launched from their premises, at Whitby, a screw steamer, built to the order of Messrs. Turner, Brightman & Co., of London. The ceremony of christening was performed by Mrs. Brightman, wife of one of the owners. The following are the dimensions of the *Zoe*:—Length, over all, 228-9 ft.; length between perpendiculars, 288 ft.; breadth, 38-2 ft.; depth to top of floor-plate, 19 ft. 9 in. She is built to class 100 A 1 at Lloyd's, and has a deadweight capacity of about 3,440 tons. Emerson, Walker & Co.'s patent windlass stands on fore-castle deck.

**Beatrice.**—On November 7th Messrs. Richardson, Duck & Co. launched from their shipyard, at South Stockton, a finely modelled steel screw steamer of the following dimensions, viz.:—Length, over all, 217 ft.; breadth, extreme, 29 ft.; depth, moulded, 15 ft. 7½ in. The vessel is built for the 100 A 1 class at Lloyd's, to the order of Michael Murphy, junr., Esq., of Dublin. She has a half poop, quarter-deck to fore end of machinery space, and a topgallant fore-castle; a double bottom capable of holding 200 tons of water ballast. The engines, by Messrs. T. Richardson & Sons, Hartlepool, are triple-expansion, with cylinders 16½ in., 26½ in., and 45 in. by 33 in. stroke. As the vessel was leaving the ways she was gracefully christened the *Beatrice* by Miss Beatrice Murphy, daughter of the owner. The *Beatrice* is intended for the coal trade between Lancashire and Dublin.

**Yerax.**—On Thursday, November 7th, Messrs. Edward Withy & Co. launched from their yard, at Hartlepool, a large steel screw steamer, built to the order of George Horsley, Esq., West Hartlepool. She is a steel vessel measuring over 300 ft. in length, constructed throughout of Siemens-Martin steel, and built to the highest class at Lloyd's. She has a long raised quarter-deck, long bridge house, and topgallant fore-castle. The holds are fitted with iron grain divisions and iron cargo battens; all decks, deck erections, skylights, bulwarks, bulkheads &c., are constructed of steel and iron. In the main and after holds the vessel is built on the web-frame system, which gives a very strong type of ship and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and aft for water ballast, and the after peak is also available for

water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey boilers, steam steering gear amidships, screw gear aft, direct steam windlass on fore-castle, patent stockless anchors hauling up into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin, providing accommodation for the passengers, captain, and officers, is handsomely finished in polished hard wood, with neatly painted panels executed in a very effective style by the decorative staff of ladies employed by the firm. The vessel will be rigged as a two-masted fore-and-aft steamer, with steel pole-masts and all cargo appliances for expeditious handling of cargo. The engines have been constructed by Messrs. T. Richardson & Sons, Hartlepool, and are of the triple-expansion type, with two large single-ended boilers. The hull and machinery have been constructed under the personal supervision of Mr. T. G. Barron. On leaving the ways the vessel was gracefully christened *Verax* by Miss Liddell, of London. This is the eleventh steamer built by this firm for the same owner.

**Regina.**—On November 8th Messrs. Short Brothers launched from their yard, at Pallion, a steel screw steamer, built to the order of Messrs. Taylor & Sanderson, of Sunderland. Her principal dimensions are:—Length, 292 ft.; breadth, 40 ft.; and depth of hold, 27 ft. 6 in. The vessel is constructed entirely of steel, and to the highest class in Lloyd's Registry, under special survey, as a spar-deck steamer. The vessel was named *Regina* by Mrs. McIntosh, of Halifax. The vessel is to be fitted with quadruple-expansion engines by Messrs. Allen & Co., of Sunderland, having three steel boilers of 200 lbs. pressure, with all the latest improvements in marine engineering, also patent direct steam windlass by Emerson, Walker & Co.

**May.**—On November 9th Messrs. John Priestman & Co. successfully launched from their shipbuilding yard, Southwick, a steel screw steamer of the following dimensions:—Length 240 ft.; extreme breadth, 32 ft.; depth, moulded, 16 ft. 7 in. She is built to the order of Mr. G. Hopkins, of Cardiff, and is of the raised quarter-deck type aft, and part awning deck forward, and is to be classed 100 A at Lloyd's. The engines have been built by Messrs. William Allen & Co., Scotia Engine Works, Sunderland, and are of the triple-expansion type, of about 700 I.H.P. There are two boilers, having a working pressure of 160 lbs. She is fitted with patent windlass by Emerson, Walker & Thompson Bros., Limited.

**Sirius.**—On November 9th, the Messrs. Blyth Shipbuilding Co., Limited, launched from their building yard, at Blyth, an iron screw steamer, which is the eighth launched by them this year. The principal dimensions of the vessel just launched, and which has been built on Bremen account, are as follows:—Length, 181½ ft.; breadth, 26 ft.; depth of hold, 15½ ft. She has been built to Lloyd's highest class, and is fitted with water ballast and has web frames, &c. The captain, officers', and engineers' cabins, together with a handsome saloon, are under the bridge, and the crew are berthed under the topgallant fore-castle. There are powerful steam winches in each hold by Messrs. J. Smith & Sons, of Newcastle-on-Tyne, for the rapid loading and discharging of cargo. Harfield's patent windlass is placed on the fore-castle deck for working the patent stockless anchors. A suitable steering gear is fitted on the bridge, and a large screw gear aft. The engines are of the triple-expansion type, of about 450 I.H.P., and will be supplied by Messrs. Matthew, Paul & Co., of Dumbarton. As the vessel left the ways she was gracefully named the *Sirius* by Miss Nixon, of Blyth. The *Sirius* will be commanded by Captain Gehrman.

**Remus.**—On November 22nd Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length, 310 ft.; breadth, 41 ft. 6 in.; depth, 23 ft. 0½ in.; built to the order of C. Anderson, Esq., of Hamburg, and to class 100 A1 at Lloyd's. The vessel is of the well-deck type, with poop containing saloon and cabins, for officers, and a few passengers, having the entrance through a house which forms a smoking-room; long raised quarter-deck joining a long bridge, which is of extra strength, carried right up to the fore hatch, and containing crew's quarters at fore-end, and engineers' berths aft; open topgallant fore-castle with Emerson, Walker & Co.'s direct steam windlass. The hull is built on the web-frame principle, dispensing with hold beams and giving a clear hold for stowing bulky cargo. Large hatchways are fitted, four steam winches, steam steering gear amid-

ships, screw gear aft, two donkey boilers, and cellular double bottom throughout for water ballast. The rig will be schooner with double foretopsails and topgallant sail. The boats will be carried overhead on beams, and a full equipment of modern appliances provided for general trading. The Central Marine Engine Works of Messrs. W. Gray & Co., Limited, supply the engines, which are of the triple-expansion type of 1,200 H.P., and two large steel boilers to work at 160 lbs. pressure per square inch. The ship is being inspected by Captain P. H. Simonsen, who will also take command of her, and the christening ceremony was gracefully performed by Mrs. Simonsen, wife of the captain, the vessel being named *Remus*.

**Soudan.**—On November 23rd the Naval Construction and Armaments Co., of Barrow, launched the steamer *Soudan* for Messrs. Elder, Dempster & Co., of Liverpool. The vessel is of steel, and is 311·6 ft. long, 39 ft. beam, 24·7 in. deep., and is fitted with Emerson, Walker & Co.'s combination windlass. The *Soudan* is similar in every respect to the *Matadi* and *Borna*, recently launched from this yard for the British and African Steam Navigation Co. Another steamer for Elder, Dempster and Co. will be launched in the course of a few weeks, the plating of which is well forward.

**Strathdee.**—On November 23rd there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer, which has been built to the order of Messrs. Burrell & Sons, of Glasgow. She is of the following dimensions, viz.:—Length, 300 ft.; breadth, 41 ft.; depth, 22 ft.; and is built under Lloyd's special survey to class 100 A1 on the well-deck rule. This steamer has water ballast right fore and aft on the cellular system, and is fitted with all modern improvements for the rapid loading and discharging of cargo, including large donkey boiler and four double-cylindrical steam winches, and has direct acting steam windlass, steam steering gear, by Messrs. Muir & Caldwell, and Hastie's screw gear aft. The engines, which are to be supplied by Messrs. Wigham, Richardson & Co., are of the triple-expansion type, having cylinders 23 in., 37 in., and 62 in., by 42 in. stroke, with two large boilers working at 160 lbs. pressure. On leaving the ways the vessel was gracefully named the *Strathdee* by Miss Philipson, of Tynemouth.

**Hockheimer.**—On November 23rd there was launched from the yard of the Sunderland Shipbuilding Co., Limited, the eighth steamer built by that firm for the Hansa Steamship Co., of Bremen. The length of this vessel is 323 ft.; breadth, 41 ft.; and depth of hold, 27 ft. 6 in. The steamer is built to the spar-deck rule and has large topgallant fore-castle to accommodate crew and firemen, and long bridge amidships, under which is placed the saloon and accommodation for captain, officers, and a few first-class passengers. The vessel is constructed upon the web-frame principle, thus dispensing with hold beams, and has cellular water ballast all fore and aft. All weather decks are of wood and all frames of Z steel. Her class will be 100 A1, Lloyd's special survey, and also the highest class in the German Registry. The deck machinery consists of five large steam winches; Harrison's steam steering gear, which is placed in the engine-room and worked from the bridge; Harfield's patent direct steam windlass; Tyzack's patent anchors, and all the usual appliances for handling cargo and working the ship with the greatest possible despatch. The main engines are upon the tri-compound principle by the North-Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 23½ in., 37 in. and 64 in. by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel during construction has been inspected on behalf of the owners by Mr. Wulff and Mr. Himer, and upon leaving the ways was gracefully named *Hockheimer* by Miss May Irwin, after which she was towed into the South Dock to receive her machinery.

**Maori King.**—On November 23rd this handsome-looking spar-decked vessel was successfully launched from the yard of Messrs. Doxford & Sons, of Sunderland. She has been built to the order of Messrs. W. Ross & Co., of London, is entirely of steel, and built to Lloyd's highest class, the principal dimensions being, viz.:—Registered length, 365 ft.; breadth, extreme, 44 ft.; depth, moulded, 30 ft. The engines are triple-expansion, built by the builders of the vessel, and have all the latest improvements, the cylinders being 27 in., 44 in., 72 in. by 48 in. stroke, being supplied with steam from two double-ended boilers, 14 ft. diameter by 16 ft. long. She is fitted with Bow, McLachlan's patent steam steering gear, placed in the engine-

room; screw gear aft by Crawford Brothers, of Monkwearmouth; five 7 in. by 12 in. winches by Welford Brothers, of Pallion; the windlass being by Emerson, Walker & Thompson Brothers, of Gateshead. She is also fitted with the latest improvements to carry about 18,000 carcasses for the New Zealand meat trade, and has accommodation for a few passengers in the poop aft, where the captain is also quartered. The engineers and officers are accommodated in after end of bridge amidships, the crew and petty officers are in the fore-castle, while the refrigerating engineers are in the fore-end of the bridge. As she left the ways she was christened by Mrs. Crawford, of Glasgow, wife of the superintending inspector, and within the hour her masts were shipped into place, which, as usually fitted by this firm, are to suit Manchester canal bridges.

**Petrolia.**—On Saturday afternoon, November 23rd, Messrs. Craig, Taylor & Co., launched from their Thornaby Shipbuilding yard, Stockton-on-Tees, one of the largest and handsomest vessels that they have as yet built; her dimensions are as follows:—Length, 301 ft.; breadth, 37 ft.; depth, moulded to spar-deck, 26 ft. The vessel has been built to the order of Alfred Stuart, Esq., of London, and has been specially designed and constructed by the builders for carrying oil in bulk. She is divided into 13 compartments, and fitted with cofferdams to promote safety. Her bunkers are also arranged to carry oil as fuel, and she is built to the highest class in Lloyd's under special survey. She is rigged as a three-masted schooner, and fitted with Pepper's steam steering gear, outfit of winches by Robert Roger & Co., and patent steam windlass by Emerson, Walker & Thompson Bros. Limited, she has also steam cooking apparatus by Grieve & Gillespie. The engines have been constructed by Black, Hawthorn & Co., on the triple-expansion surface-condensing principle with cylinders 22 in. 36 in. and 58 in. diam. by 42 in. stroke; two boilers 14 ft. 9 in. by 10 ft. 6 in. long, with six Brown's ribbed furnaces, working pressure 160 lbs. per square inch. She has also Kirkaldy's feed heater, steam turning and reversing gear with steam brake. Indicated power in ordinary working 1,100 horses. The vessel is also fitted with very superior pumping arrangements, and a magnificent installation of electric light by Messrs. Hayward, Tyler & Co., hydraulic and electrical engineers, of London. The wiring is carried out on the double-wire principle, and the wires are thoroughly cased and protected throughout. This vessel has been specially constructed so that she may carry cattle, and also ordinary goods, her trunks being cut down by special design of the builders so as to permit of ready loading and discharging of ordinary cargo. Her tanks have all been tested on the stocks and passed by Lloyd's surveyor, under the superintendence of Mr. Bissett, the owner's representative, and Mr. Bushell, of Newcastle, the representative of the charterers, the builders having put down special pumping arrangements so as to facilitate this most important work. This is the second vessel Messrs. Craig, Taylor & Co. have built for the purpose of carrying oil in bulk, and they have other two large vessels of similar class on hand. Before gliding into the water she was gracefully christened the *Petrolia* by Mrs. Fleming, of Normanby Hall, a friend of the owner, and after the ceremony this lady was presented with a bouquet by Master Craig. A large company then withdrew to the office of the builders, where cake and wine were served; amongst the company were the following:—Alfred Stuart, Esq., Mr. and Mrs. Ford, Dr. and Mrs. Wilson, Rev. and Mrs. Bogue, Tom Westgarth, Esq., Mat Dodds, Esq., Rev. Canon Shannahan, Mrs. Craig, Mr. Anderson, Mr. Crosthwaite, Mr. Henderson, Mr. and Mrs. Hutchinson, Mr. and Mrs. Arthur Taylor, Mr. and Mrs. Robson, Mr. Luther Green, Mrs. Armour, and others.

**Beaver.**—On November 25th there was launched from the iron and steel shipbuilding yard of Messrs. Schlesinger, Davis, & Co., Wallsend-on-Tyne, a steel screw steamer, built to the order of Robert Thomson, Esq., of London. Her principal dimensions are as follows:—Length, between perpendiculars, 138 ft.; breadth, moulded, 22 ft. 8 in.; depth, moulded, 11 ft. 6 in. She has a long raised quarter-deck, short bridge, and topgallant fore-castle. This vessel has been built to the highest class at Lloyd's. Accommodation for the captain and officers has been provided under the raised quarter-deck aft, and the fore-castle is fitted up for the crew. The vessel will be rigged as a fore-and-aft schooner, and will be fitted with triple-expansion engines and steel boiler by Messrs. Hanna, Donald & Wilson, Abbey Works, Paisley. On leaving the ways the vessel was named the *Beaver*.

#### LAUNCHES—SCOTCH.

**Katoria.**—On October 24th Messrs. W. Denny & Bros., Dumbarton, launched the steel screw steamship *Katoria*. Builders' dimensions:—240 ft. by 34 ft. by 26 ft. 6 in. to shade deck. Gross tonnage, about 1,120 tons. Messrs. Denny & Co. supply the engines on the triple-expansion principle. The *Katoria* has been built for the British India Steam Navigation Co., Limited.

**Rajah Brooke.**—On October 25th Messrs. Napier, Shanks & Bell launched from their yard, at Yoker, on the Clyde, the *Rajah Brooke*, a steel screw steamer of about 990 tons, 225 ft. by 31 ft. 6 in. by 22 ft. 9 in., built to the order of the Borneo Co., Limited, of London. The vessel has been constructed to Lloyd's shade deck class to the design of Mr. J. H. Ritchie, of London, and built under the supervision of Mr. Wm. M'Nab, with accommodation for first and second class and native passengers. All cabins and exposed woodwork are of selected teak, the 'tween decks being open at the sides with shutters, and the shade deck will be protected by a double set of canvas awnings all fore and aft. The deck fittings include Napier's steam windlass and steam steering gear, two steam winches, and teak boats with disengaging gear. The vessel is fitted with electric light, electric fan, and electric bells. The engines are triple-expansion of the most improved type by Messrs. Bow, M'Lachlan & Co.

**Musashi Maru.**—On October 25th Messrs. Lobnitz & Co. launched from their shipyard, Renfrew, the s.s. *Musashi Maru*, built for the Nippon Yusen Kaisha of Tokio, Japan. The steamer is the latest addition to this company's already large fleet of passenger and cargo steamers, and is fitted up in every way suitable for the comfort of passengers in a hot climate, as well as with every modern appliance for loading and discharging cargo. Her dimensions are 300 ft. between perpendiculars, by 40 ft. beam, moulded, by 28 ft. depth, moulded, to upper deck, and her engines are on the triple-expansion principle, with three cranks, and three cylinders, 24 in., 40 in., and 66 in. diameter, and 4 ft. stroke, intended to develop at least 2,000 H.P. The ship was named by Mrs. A. R. Brown, the wife of the representative of the company in this country, and the launch was in every way successful. Immediately after the launch the *Musashi Maru* was taken into the builders' dock, where she will receive her machinery, also constructed by the builders.

**Siam.**—On October 26th the Grangemouth Dockyard Co. launched from their shipbuilding yard, at Grangemouth, a handsomely-modelled steel barque of 700 tons, which on leaving the ways was gracefully named *Siam* by Mrs. L. M. Bodin, of Sunderland. The *Siam* has been built to the order of A. O. Liudvig, of Kragero, Norway, and is specially designed for carrying teak from Moulmein, having web frames and no hold beams, thus giving a clear hold for storage of cargo, such as timber, cotton, &c., of which she will carry a very large cargo on a very light draught. The *Siam* has been built to the highest class in Norwegian Veritas, and under special survey of their surveyor, Mr. L. M. Bodin, and under the personal superintendence of Captain Falkenburg, of Christiania, who will command the vessel when she is fitted out.

**Stuttgart.**—On October 26th the Fairfield Shipbuilding and Engineering Co., Limited, launched from their yard, at Govan, the steel screw steamer *Stuttgart*, of 5,200 tons, for the Norddeutscher Lloyd of Bremen. Her principal dimensions are:—Length, over all, 430 ft. 10 in.; breadth, 48 ft., moulded; depth, 33 ft., moulded. She will be fitted with engines of the inverted triple-expansion type, with cylinders 31 in., 52 in., and 83 in. diam. by 4 ft. 6 in. stroke. The vessel is similar in every respect to the *Karlsruhe*, launched a short time ago by the same firm. As she left the ways she was named by Mrs. Knaffl, wife of the superintendent engineer of the Norddeutscher Lloyd, and amongst the others present were Captain Meyer, marine superintendent of the company, and Captain Heinke and Mr. Kruse, the captain and engineer respectively, under whose superintendence the vessel has been built. She has been coated with Hartmann's Rahtjen's composition.

**Ailsa Craig.**—On October 26th the Marquis of Lorne launched a steamer named the *Ailsa Craig* for the Clyde Shipping Co., Glasgow, from Messrs. W. B. Thompson & Co.'s Caledonian Shipyard, Dundee. He was accompanied by the Earl of Camperdown, Lord and Lady Strathmore, and several ladies and gentlemen of the city, and in the yard were about three or four thousand spectators. The vessel is of the following dimensions:—Length, over all, 362 ft. 10 in.; beam, 44 ft. 6 in.; depth in hold, 25 ft. 9 in.; gross tonnage about 3,600.

She has been built to the highest class at Lloyd's, and is fitted with triple-expansion engines from the Tay Foundry of her builders, Messrs. W. B. Thompson & Co., Limited. She is constructed upon the cellular system, which ensures a second skin available in case of the outer one being injured, the double bottom also serving for the purpose of water ballast, of which the vessel carries about 730 tons. Seven bulkheads also sub-divide the vessel into water-tight compartments. On the upper deck six steam winches are conveniently placed for the rapid handling of cargo. Steam for these and other auxiliary engines is supplied from a special boiler fired from the upper deck. Steam steering gear by Messrs. Muir & Caldwell is fitted in the wheelhouse on the bridge deck, with controlling standard in the pilot house on the bridge above. Under the poop deck aft is the main cabin, with captain's and chief officers' cabins, three state-rooms, along with rooms for chief steward and purser. Under the bridge deck amidships accommodation has been provided for officers, engineers, and petty officers, the rest of the space at the side of the engine and funnel casings being occupied by coal bunkers. At the fore-end is the chart-room, and above that, on the bridge deck, the wheelhouse. Under the fore-castle accommodation has been provided for seamen, firemen, and quartermasters, and on the deck above Napier's steam windlass and capstan is provided for working the anchors, in conjunction with a large anchor crane. Two iron light-towers on this deck carry the vessel's side lights, and keep them secure from extinction during heavy weather. The engines are triple-expansion, of 300 H.P., with cylinders of 23 in., 89 in., and 68 in., with a stroke of 54 in.—each engine working on a separate crank. Steam is supplied from three single-ended steel boilers, at a pressure of 165 lbs. per square inch.

**Queen Elizabeth.**—On October 28th there was launched from the yard of Messrs. A. McMillan & Son, Dumbarton, a steel sailing ship of the following dimensions:—240 ft. by 89 ft. 11 in. by 23 ft. 11 in. The vessel has been built to the order of Messrs. Charles Fulton & Co., owners, Nova Scotia, and after the launch she was taken alongside the builders' wharf. She was christened *Queen Elizabeth* by Mrs. Fulton.

**Capella.**—On October 28th Messrs. Charles Connell & Co. launched from their shipbuilding yard, at Whiteinch, the *Capella*, a steel screw steamer of 3,200 tons gross register, built to the order of Messrs. Thomas & James Harrison, Liverpool, and intended for the Star line of Calcutta steamers. Her dimensions are:—Length, 350 ft.; breadth, 60 ft.; depth of hold, 28 ft. She has been built of steel to Lloyd's highest class, and will be fitted out in the most complete manner. She will be fitted by Messrs. John & Jas. Thomson, Finnieston Street, with triple-expansion engines of 1,600 I.H.P., with cylinders of 24 in., 40 in., and 66 in. diam., having 54 in. stroke.

**Phoenix.**—On October 28th H.M. colonial cruiser *Phoenix* was launched from the shipbuilding yard of Messrs. James & George Thomson, Clydebank. Among the company present were:—Staff-Commander Quinn, R.N., and Mrs. Quinn; Mr. W. H. Malpas, Admiralty overseer; Mr. J. A. Bedbrook, R.N.; Captain Randall, of the s.s. *Friesland*; Mr. H. Kurdbbe, of the Japanese Navy; Mr. M. Ausdaka, Admiralty Constructor for the Japanese Government; Captain W. D. Hamilton, R.N.; Captain Fowler, Mr. J. J. Stewart, R.N., chief engineer of the *Phoenix*; Messrs. James & George Thomson, Mr. Biles, &c. The customary religious service which is gone through at the launching of ships belonging to her Majesty's Navy was conducted by the Rev. Mr. Wilson, chaplain of H.M.S. *Devastation*, and as the *Phoenix* moved off into the water Mrs. Quinn performed the ceremony of naming the ship. The *Phoenix* is one of a fleet of seven vessels now building in private establishments to the order of the Admiralty, and when fully equipped they will be sent to the Australian colony as a special squadron for the protection of Australasia. One of the other vessels, named *Physche*, is being built in Messrs. Thomson's yard, and will be launched shortly. Other three vessels of the same type, named *Pandora*, *Pelorus*, and *Persian*, are being constructed in Messrs. Armstrong, Mitchell & Co.'s establishment at Elswick on the Tyne, where also the other two vessels—torpedo-boat chasers of 735 tons, named *Wisard* and *Whiting*—are being built. These vessels are being constructed in accordance with an agreement between the Imperial Government and the colonies come to at a conference held two or three years ago, the Home Government agreeing to build and equip the ships, while the Australasians guaranteed payment of the interest at the rate

of 5 per cent. on the cost of the vessels, and the expenses incurred in manning, &c., three of the cruisers and the two gunboats when protecting the coast. The other two cruisers are to be kept as reserve vessels in Australian waters, and will be manned in times of war out of the Exchequer of the Imperial Government. The vessels are to be under the control of a commander-in-chief. The five cruisers are practically alike, and have been designed under the supervision of Mr. W. H. White, the Director of Naval Construction for the Admiralty. In dimensions and the method of protection the vessels resemble the *Medea* class, two of which type were built by the Fairfield Co. last year—the *Magicienne* and *Marathon*—but the new vessels are built of steel, whereas the steel hulls of the *Medea* class were sheathed with two thicknesses of teak planking, covered on the bottom with copper to enable them to keep the sea in foreign parts for years without requiring to be docked. The dimensions of the new vessels are:—Length, between perpendiculars, 265 ft.; breadth, extreme, 41 ft.; and the displacement will be 2,580 tons, at a mean draught of 5½ ft. The *Phoenix* has a steel protective deck, enclosing the interior of the hull under the load-line, and at the sides and fore and aft it slopes to below the load water-line, pretty much like the back of a turtle. The thickness on the level part is one inch, and on the sloping sides two inches. The conning tower, within which the commander will work the ship, is of steel 3 in. thick. Each vessel has a cellular double bottom for the carrying of water ballast. The interior of the hull is divided into a large number of main water-tight compartments, two of which are occupied by the engines and two others by the boilers. In addition, these main compartments are minutely sub-divided, especially above the protective deck, into numerous compartments, to localise effect of injury as much as possible. The armament consists of eight 4·7 in. quick-firing guns on central pivot stands, two placed on the fore-castle, two on the poop, and two each on the starboard and port sides of the upper deck; eight 3-pounder quick-firing guns and several machine guns. Four torpedo tubes are to be fitted, one aft and one forward, and one on each broadside. The 4·7 in. quick-firing guns throw a shot weighing 45 lbs. with a charge of 10½ lbs. with sufficient force to penetrate 10½ ins. of wrought iron at close range. The guns can be discharged about ten times in a minute. The propelling machinery is of the triple-expansion type, driving twin-screws. When the engines are realising 7,500 I.H.P. under forced draught, the speed of the ship will be fully 19 knots, and the speed will not be far short of 17½ knots when the boilers are working under natural draught, with a developed H.P. of 4,500. Accommodation has been provided for a crew of 190 men. The officers are accommodated under the poop aft, and the seamen forward under the fore-castle. There are the usual cabins, ward-room, gun-room, and mess rooms in each cruiser. The cruisers will be furnished with balanced rudders, so that they may be rapidly manœuvred in action, and that they may be serviceable for ramming, each vessel has been provided with a strong steel underwater spur. The *Phoenix* was coated, before being put into the water, with Hartmann's Rahtjen's Composition.

**Port-Patrick.**—On October 29th Messrs. Russell & Co., Port-Glasgow, launched from their Bay Street yard, a steel sailing barque of 1,700 tons register, to carry 2,800 tons on Lloyd's freeboard. Her dimensions are:—Length, 260 ft.; breadth, 38 ft.; depth, 23 ft. This vessel, which is named *Port-Patrick*, is to the order of Messrs. Crawford & Rowat, Glasgow, and is sister ship to the *Port-Douglas*, launched about two months ago by Messrs. Russell & Co. for the same owners. After the launch the vessel was berthed in the East Harbour, Port-Glasgow, where she will complete her outfit. Messrs. Russell & Co. will put down the keel of another vessel of similar dimensions on the vacated ways.

**Scottish Queen.**—On October 29th there was launched from the shipbuilding yard of Messrs. John Scott & Co., Kinghorn, a fine steel steam trawler, built to the order of Messrs. Robert Brown & Co., Aberdeen. Dimensions:—Length, 100 ft.; breadth, 20 ft.; depth, 11½ ft. She is expected to attain a high rate of speed, the object being to get the fish early to land for the southern markets. She is intended as a sister ship to the *Scottish Maid*, lately built at Kinghorn for the same company. She was launched with steam up, and on leaving the ways was named the *Scottish Queen* by Mrs. Brown, wife of the managing owner. She sailed to Burntisland, where she will take in coal.

**Caradale.**—On October 29th Messrs. Alex. Stephen & Sons launched from their shipbuilding works, Linthouse, Govan, a

large and beautifully-modelled steel four-masted sailing ship, of about 2,100 tons gross register, classed 100 A 1 at Lloyd's, with extras beyond their requirements. She has been built to the order of Messrs. J. & A. Roxburgh, of Glasgow, to whose fleet she will be a worthy addition. The captain and officers have handsome accommodation provided for them in the poop, while the petty officers and crew are comfortably lodged in iron houses on deck. The vessel is provided with a steam winch and all the most recent appliances for the efficient working of ship and cargo, and will be commanded by Captain Alec. Smith, late of the *Cadzow Forest*. As she left the ways she was gracefully named the *Carradale* by Miss Daisy Allison, Cartvale, Paisley. The Messrs. Stephen have a duplicate vessel on hand for the same firm.

**Hazelbank.**—On November 5th Messrs. Charles Connell & Co. launched from their shipbuilding yard, at Scotstoun, the *Hazelbank*, a steel sailing vessel of 1,640 tons, built to the order of Messrs. Andrew Weir & Co., Glasgow, and intended for their general trade.

**Capella.**—On November 5th Messrs. Morton & Co., Leith, launched a steel screw steamer named the *Capella*, built for Messrs. Holind & Molzen, Flensburg. The vessel, which will be employed in the Baltic trade, is 223 ft. long, 32 ft. 9 in. broad, and 16 ft. deep, and will carry about 1,600 tons. She will be fitted by the builders with triple-expansion engines of 16½ in., 27 in., and 42 in. cylinders by 33 in. stroke.

**Stanley.**—On November 5th Messrs. Russell & Co. launched from their Kingston Yard, Port-Glasgow, a four-masted steel sailing ship of 2,200 tons register, to carry 3,600 tons deadweight on Lloyd's freeboard. Dimensions:—Length, 278 ft.; breadth, 42 ft.; depth of hold, 24 ft. 6 in. This vessel is built to the order of Mr. G. M. Steeves, Liverpool, is built to Lloyd's highest class, and is supplied with all the most approved appliances for a cargo-carrying sailing ship. On leaving the ways she was named *Stanley*. The vessel was towed to the James Watt Dock, where she will complete her outfit, and will afterwards load at Liverpool.

**Duchess of Albany.**—On November 7th Messrs. Scott & Co., Greenock, launched a paddle steamer for the London and South-Western Railway Co. and the London, Brighton, and South-Coast Railway Co. Dimensions:—Length of keel, 170 ft.; breadth, moulded, 22 ft.; depth, moulded, 9 ft. Compound engines, of 700 I.H.P., will be supplied by the builders. The steamer was named the *Duchess of Albany* by Mrs. Fisher, wife of the engineer surveyor of the railway company. The new boat is for passenger service between Portsmouth and Ryde, Isle of Wight. She is sister steamer to the *Alexandra*, built by the firm in 1879.

**Langosta.**—On November 7th Messrs. Blackwood & Gordon, shipbuilders and engineers, Port-Glasgow, launched a steel screw steamer of the following dimensions:—Length, 153 ft.; breadth, 28 ft.; depth, 9 ft. 6 in.; of about 500 tons register. This steamer is to the order of Messrs. James & Alexander Allan, Glasgow, and is a duplicate of one launched by Messrs. Blackwood & Gordon about a fortnight previously for the same owners. She will be supplied by the builders with triple-expansion engines. The vessel was named *Langosta* by Miss Johnstone, daughter of Mr. David Johnstone, superintendent for the Messrs. Allan.

**Garnet.**—On November 8th there was launched from the shipbuilding yard of Messrs. Scott & Co., Bowling, a screw steamer named the *Garnet*, of the following dimensions:—Length, 165 ft.; breadth, 26 ft.; depth, 12 ft. 2 in.; built to the order of Mr. William Robertson, 88, Great Clyde Street, Glasgow, and intended for his general coasting trade. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Portman Street, Glasgow.

**Amra.**—On November 9th the Ailsa Shipbuilding Co. launched for the British India Steam Navigation Co., Limited, a steel screw steamer named *Amra*, 190 ft. by 29 ft. by 20 ft., moulded to shade deck. She is to be employed in the company's Indian coasting trade, and is a sister ship to the s.s. *Aska*, which left recently for Calcutta. Her engines, which are being fitted by Messrs. Dunsmauir & Jackson, Govan, are triple-expansion, 16 in., 26 in., and 42 in. cylinders, and 30 in. stroke. She is being fitted with steam windlass, steam steering gear, and electric lighting throughout the ship.

**Parkmore.**—On November 9th Messrs. Gourlay Brothers & Co., Shipbuilding Yard, Dundee, launched a large steamer for Messrs. Wm. Johnston & Co., Liver-

pool. The vessel, which is named the *Parkmore*, is the largest yet built on Tayside. Her dimensions are as follows:—Length, 372 ft.; beam 46 ft.; and depth from upper deck, 31 ft. 6 in. Above the upper deck there is another deck extending the whole length of the vessel, the space below being utilised as a shelter for cattle, for the carrying of which the steamer has been specially designed. She has accommodation for 1,200 head of cattle. Built throughout of steel, she is in excess of Lloyd's highest grade and Board of Trade requirements, and carries an American passenger certificate. The vessel is divided into nine water-tight compartments by eight bulkheads, and has water ballast tanks to carry 900 tons. Her gross registered tonnage is about 3,900 tons, with a deadweight carrying capacity of about 5,500 tons. All the most modern appliances have been provided for the rapid handling of the cargo. Sixteen winches are placed on the upper deck, Harrison's steam steering gear in the engine-room, and Emerson & Walker's windlass on the fore-castle head. She is to be schooner-rigged, with two pole masts, and patent reefing topsails. She is to be supplied by her builders with triple-expansion engines of 500 H.P., with cylinders of 29 in., 45 in., and 74 in. diameter, and a stroke of 4 ft. 6 in., steam being supplied to the extent of 160 lbs. pressure, by three double-ended boilers, 12 ft. 6 in. in diameter, and 17 ft. in length, and capable of developing about 2,500 H.P.

**British India Association.**—On November 11th Messrs. A. & J. Inglis launched from their shipbuilding yard at Point-House a steel screw steamer of 5,000 tons gross register, built to the order of the British India Association, and intended for the Australian trade. Her dimensions are:—Length, 420 ft.; breadth, 46 ft.; depth, 31 ft. She has accommodation for 80 first-class passengers and 30 second-class passengers, and will be lighted throughout by electricity. Her engines will be of the triple-expansion type, to indicate 4,500 H.P., with cylinders of 33 in., 52 in., and 86 in. diameter by 60 in. stroke.

**G. Ward Cole.**—On November 20th Messrs. William Simons launched, at Glasgow, the second of two powerful iron screw dredging steamers, ordered by the Melbourne Harbour Commissioners for the improvement of the port. It was named *G. Ward Cole*.

**Baroda.**—On November 20th the London & Glasgow Iron Shipbuilding Co., Limited, launched from their yard at Govan, a steel screw steamer named the *Baroda*, the first of a new line of steamers between Hamburg and Calcutta. The dimensions are as follows:—Length, 340 ft.; breadth, 42 ft.; and depth, moulded, 29 ft.; the gross measurement being 3,000 tons, and deadweight carrying capacity 4,000 tons. The engines, which are being supplied by the builders, are of the tri-compound type, the cylinders being 24½ in., 37 in., and 64 in. in diameter by 48 in. stroke.

**Paragon.**—On November 23rd the Ailsa Shipbuilding Co., of Troon, launched a steel screw steamer, 142 ft. by 25½ ft. by 12 ft. 11 in., moulded, for Captain John Weatherill, of Dublin. This is the second steamer built for the same owner. She will be employed in the coal carrying trade between Garston and Dublin, and will be fitted with triple-expansion engines, 14 in., 22 in., and 36 in. cylinders by 27 in. stroke, by Mr. William Kemp, Govan. The vessel was named *Paragon* by Master Archibald Weatherill, son of Captain Weatherill.

**Puritan.**—On November 23rd Messrs. John Reid & Co. launched from their building yard, Port-Glasgow, a handsomely-modelled four-masted steel sailing ship of 3,600 tons burthen for Messrs. R. W. Cameron & Co., of New York. This vessel, which was named the *Puritan* by Mrs. W. W. B. Rodger, wife of Provost Rodger, Greenock, is built on somewhat similar lines to those of the *Irex*, lately built by Messrs. Reid & Co. for Mr. J. D. Clink, Greenock. The new ship will be masted at Greenock, and thereafter towed to Port-Glasgow, where she will be fitted out.

**Malange.**—On November 23rd Messrs. Scott & Co., Greenock, launched a steel screw steamer named the *Malange* for the Mala Real Portuguesea of Lisbon. Her dimensions are as follows:—Length, 363 ft.; breadth, 42 ft.; depth, 26 ft.; and of 3,200 tons register. The *Malange*, which will be supplied by the builders with engines of 4,000 I.H.P., is the last of the splendid fleet of five steamers ordered by the Mala Real Portuguesea of Lisbon from Messrs. Scott & Co. in November last, the former vessels being the *Tungue*, *Rei de Portugal*, *Loanda*, and *Mocambique*.

**Bonaccord.**—On November 23rd the *Bonaccord*, one of the largest steamers built at Aberdeen for some time, was launched

from the building yard of Messrs. A. Hall & Co. The vessel is of the following dimensions:—Length, 245 ft.; breadth, 34 ft.; depth, 17 ft.; deadweight capacity, 2,000 tons. She is fitted with triple-expansion engines of 210 H.P. nominal, having cylinders 21 in., 34 in. and 56 in. with a stroke of 39 in., and two steel boilers working at 160 lbs. pressure. The *Bonaccord* has been built to the order of Messrs J. & F. Davidson, Aberdeen, and is intended for the Baltic and Mediterranean trade.

#### LAUNCHES.—IRISH.

**Mount Hebron.**—On October 26th Messrs. MacIlwaine & McColl launched from their yard at Belfast a large screw steamer, named the *Mount Hebron*, for Messrs. Smith & Service, of Glasgow. The *Mount Hebron* is 300 ft. in length, 41 ft. 4 in. in beam, and 22 ft. in depth, moulded. She is constructed of steel throughout, with a cellular double bottom, and is of the well-deck type, with raised quarter-deck and long bridge. Her carrying capacity is about 3,600 tons. Triple-compound engines, with cylinders 23 in., 37 in., and 60 in. diameter by 42 in. stroke, and 1,400 H.P. will be fitted in. The boilers will be two in number, with six spiral corrugated furnaces, made by Farnley & Co., with a working pressure of 160 lbs.

**Bahadur.**—On October 26th a large screw steamer was successfully launched from Messrs. Harland & Wolff's shipbuilding yard, Queen's Island, Belfast. As she left the ways she was named the *Bahadur*. The vessel, which is a sister ship to the *Nawab*, launched in September last, has been built for the Asiatic Steam Navigation Co., and designed for the East Indian trade. Her length is 345 ft.; breadth, 42 ft.; gross tonnage, 2,970. She will be fitted with triple-expansion engines, also constructed by Messrs. Harland & Wolff, and powerful steam winches for rapid loading and discharge of cargo.

**Lonsdale.**—On October 29th, at high water, there was launched from the Foyle Shipbuilding yard, Londonderry (Mr. Charles J. Bigger's), a fine steel sailing ship, built to the order of Mr. J. H. Iredale, Liverpool. Her dimensions are as follows:—Length, 266 ft.; breadth, 39 ft. 5 in.; depth of hold, 23 ft. 2 in.; registered tonnage, 1,670 tons. There was a large party present to witness the launch, and the ceremony of naming the vessel the *Lonsdale* was very gracefully performed by Mrs. Dougherty, wife of Professor Dougherty, Magee College, Derry. The *Lonsdale* has been built to Lloyd's highest class, and will be fitted with all the most recent improvements. After the launch she was towed to the finishing berths, where she will receive her masts, &c. The shipbuilding industry is very brisk in Derry at present, Mr. Bigger having on hand close on 9,000 tons of shipping for Liverpool owners. The tonnage launched from or building at the yard since it started two-and-a-half years ago amounts to over 20,000 tons. This tonnage includes two more ships at present being built for Mr. Iredale, to be called the *Hawksdale* and *Foyledale*.

#### LAUNCH.—DANISH.

**Yrsa.**—On October 26th the new steamer *Yrsa* was successfully launched from the Elsinore Iron Shipbuilding & Engineering Co., Denmark. She is built for the Østersøen Steamship Co., Copenhagen, entirely of steel, to Bureau Veritas, highest class special survey. She is 148 ft. long in the main deck; 24 ft. broad; and 11 ft. deep in the hold. The engine will be a 250 I.H.P. compound,

#### LAUNCHES.—SWEDISH.

**Gota.**—On October 26th this first-class Swedish cruiser was launched at the Lindholmen shipbuilding yard at Gothenburg. The vessel, a sister ship to the *Svea*, is of 3,100 tons burden, and will have a speed of 16 knots. She is built of Swedish steel, and armed with two Armstrong 9½-inch guns, manufactured at Elswick, five 2½-inch Maxim-Nordenfeldt guns, four four-barrelled, and two two-barrelled 0.936-inch machine guns, besides torpedoes. She is also fitted with the electric light.

**Baron Stjerublod.**—On October 31st there was launched from the Lindholmen Shipyard, at Gothenburg, the *Baron Stjerublod*, built for account of the United Steamship Co., Copenhagen. The principal dimensions of the vessel are:—Length, 213½ ft.; breadth, 31 ft. 6 in.; depth of hold, 18 ft. 10 in.; capacity, 1,240 tons deadweight. The engines are triple-expansion,

with surface condensers, and are to develop 700 I.H.P. There are two cylindric tubular boilers. The *Baron Stjerublod* is intended for the wine, &c., traffic. Since the middle of August the Lindholmen Shipyard has completed steamers with an aggregate of 8,000 tons, and the place of the *Baron Stjerublod* on the slips has been taken by a new tank steamer for a Baku firm.

#### LAUNCH.—GERMAN.

**Cleopatra.**—On October 14th the Flensburg Shipbuilding Co. launched from their shipyard, in Flensburg, a very fine steel passenger steamer built for the Hamburg Pacific Line, for which M. A. Kirsten is managing director and principal shareholder. This steamer has following dimensions:—323 ft. by 40 ft. by 29 ft., and is classed 1st div. + Veritas. She has accommodation for a large number of emigrants and for 20 first-class passengers. The triple-expansion engines of 1,500 H.P. will be supplied by the Flensburg Shipbuilding Co., and is now being fitted on board. On leaving the ways she was christened *Cleopatra* by Miss Bertha Molzen.

#### TRIAL TRIPS.

**Trio.**—On October 9th the new steamer *Trio*, built of wood on iron ribs at the Torskag Engineering Co., Sweden, made her trial trip. Her engines are 60 H.P. and her capacity 550 tons deadweight. She is intended for the North Sea Baltic traffic.

**Heimbürg.**—On October 16th the new steamer *Heimbürg*, built by the Elsinore Iron Shipbuilding and Engineering Co., Elsinore, Denmark, for account of the German Steamer Co., Hansea, at Bremen, made a satisfactory trial trip in the Sound. The *Heimbürg* is built entirely of steel to English and German Lloyd's highest class, special survey, is 272 ft. long, 37 ft. broad, and 15½ ft. deep in the hold. She has water ballast in double bottom constructed on the bracket system the whole length of the steamer, steam steering and anchor gear, &c. The engines are of the triple-expansion system, with surface-condenser, and of 850 I.H.P. At the trial trip the engines developed 1,125 I.H.P. and worked very satisfactorily. The speed was 12 knots, and consumption of coal is stated to have been but 1½ lb. per I.H.P. per hour.

**Blackheath.**—On October 22nd this vessel, 300 ft. by 41 ft. 6 in. by 21 ft. 9 in., built by Messrs. William Gray & Co., of West Hartlepool, for Messrs. Watts, Ward & Co., London, left West Hartlepool for her trial trip. Her engines are built on the triple-expansion principle, of 198 H.P. nominal, having cylinders 23 in., 27½ in., and 62½ in. by 39 in. stroke, and working at 160 lb. pressure. They have been built by Messrs. Blair & Co., Limited, Stockton-on-Tees. The steamer made a most successful run, everything working satisfactorily.

**Dovre.**—On Wednesday, October 23rd, Messrs. Edward Finch & Co., Limited, of Chepstow, ran a very successful trial trip of the s.s. *Dovre*, built to the order of Mr. John Pile, of London. Her dimensions are:—160 ft. by 25 ft. by 12 ft. 3 in., with a deadweight carrying capacity of 650 tons. She is fitted with triple-expansion engines, and on an eight hours' run averaged a speed of 10½ knots.

**Strathleven.**—On October 24th the screw steamer *Strathleven*, owned by Messrs. Burrell & Son, went down the Clyde on her official trial trip, after having been tripled by Messrs. A. & J. Inglis, Pointhouse. Satisfactory results have been got by the conversion of the compound engines of the screw steamer *Strathleven* to triple-expansion type. This vessel, which is owned by Messrs. Burrell & Sons, Glasgow, was constructed in 1875, in the yard at Dumbarton, which was then occupied by Messrs. Burrell, but is now vacant. The dimensions are:—320 ft. long, by 36 ft. beam, by 26 ft. deep, with a gross tonnage of 2,436 tons. The compound engines were constructed by Messrs. Blackwood & Gordon, Port-Glasgow. The cylinders were 38 in. and 70 in. in diameter respectively, and the stroke 42 in., the boiler pressure being 70 lbs. In carrying out the conversion, new cylinders have been provided, but all the same the old engines have been utilised, a third throw being fitted for the high-pressure piston. The diameters of the new cylinders are 23 in., 37 in., and 62 in., and the stroke of course remaining as before. Two new single-ended boilers have been fitted on board. Each is 13 ft. 6 in. by 10 ft.; having six furnaces with corrugated flues, the mean diameter being 8 ft. 3 in. The heat-

ing surface is 3,200 square feet, and the grate area 100 square feet. On trial the maximum speed was 10.76 knots, and the H.P. developed was 1,200 I.H.P., as against 1,000 I.H.P. with the compound engines, while the speed formerly was 9½ knots. The coal consumption, it is considered, will be reduced from 23 to 17 tons per day. The result was considered highly satisfactory by both owners and engineers.

**Collingwood Dickson.**—On October 25th this new boat recently built by the Government, at H.M. Gun Wharf, Portsmouth, and engined by Messrs. Vosper & Co., of Portsmouth, went on her official steam trial. The War Department was represented by Mr. Hay, inspector of machinery, Woolwich, and Mr. Travis of the same department, whilst Mr. Vosper was present on behalf of his firm. The machinery worked very efficiently, without the least hitch, the engines developing greater I.H.P. than was contracted for, driving the vessel at a mean speed of 11½ knots during a continuous run of four hours.

**Indtrønderen.**—On October 26th the new steamer *Indtrønderen*, built at the Aker Engineering and Shipbuilding Co., Norway, made her official trial trip. She is built for the Indtrøndelagen's Steamer Co., and is 127 ft. long. She made 12 knots, the contracted speed being only 11½ knots.

**Baltimore.**—The new American cruiser *Baltimore* has returned to Philadelphia from her second trial trip. It is unofficially reported that her speed averaged 20.1 knots during a four hours' run at sea off the Delaware capes. The engines developed about 300 H.P. beyond the contract requirements of 9,000.

**Holyrood.**—On October 26th the trial trip of the steamer *Holyrood* took place on the Clyde, under very favourable auspices, there being a large party of ladies and gentlemen present. The *Holyrood* was built by Messrs. Robert Duncan & Co., Port-Glasgow, and engined by Messrs. Rankin & Blackmore, Greenock. Her carrying capacity is 4,100 tons, and her engines are of the quadruple-expansion type of 167 N.H.P., the consumption of fuel being calculated at 15 tons per day. Messrs. Raeburn & Vérel, Glasgow, are the managing owners, and this steamer is intended for their general cargo trade. The results of the trial were in every respect satisfactory. The vessel was trimmed with 750 tons of coal, and on the mean of four runs over the measured mile a speed of 10½ knots was attained with a superfluity of steam, this rate being ¾ of a knot in excess of requirements. The runs upon the "mile" being finished, the vessel proceeded under easy steam towards the Cumbræes, across to Rothesay Bay, and along the Innellan shore.

**Camiola.**—On October 28th the new steel screw steamer *Camiola*, built by Messrs. John Redhead & Sons, West Docks, South Shields, was taken to sea on her trial trip. The steamer has been built to the order of Messrs. Chapman & Miller, Newcastle-on-Tyne, and is of the following dimensions, viz.:—290 ft. by 39 ft. by 20 ft. She is of the improved well-deck type, having long raised quarter deck, long bridge amidships and topgallant forecabin, and is classed 100 A1 at Lloyd's under special survey. The vessel is fitted with triple-expansion engines, also built by Messrs. John Redhead & Sons, having cylinders 28 in., 37½ in., 61½ in., and 89 in. stroke, supplied with steam at a pressure of 160 lbs. per square inch, from two large steel boilers. After having had her compasses adjusted, the vessel made several successful runs, the mean speed being 11 knots, the performance of the vessel giving every satisfaction to all concerned.

**Monte Video.**—On October 29th the trial trip took place of the twin-screw steamer *Monte Video*, built by the Ailsa Shipbuilding Co., Troon, and engined by Messrs. Rowan & Son, Glasgow, for the "Meisagerias Fluvials Del Plata." Designed and built of steel under the superintendence of Captain Climaco Becker, the *Monte Video* is intended for cargo and passenger traffic on the River Plate, her dimensions being as follows:—Length, 200 ft.; breadth, 31 ft.; depth, moulded to main deck, 11 ft. She is fitted with two sets of triple-expansion engines, 14 in., 22 in., and 36 in. cylinder, 24 in. stroke, having a working pressure of 160 lbs. to the square inch. The main feature of the boat is her light draught, which will enable her to steam 1,500 miles up the River Plate, her mean draught when loaded with 100 tons of cargo being 6 ft. 8 in. The *Monte Video* is provided with cabin accommodation for 200 first-class and 60 second-class passengers, and has three decks—the main, saloon, and promenade, the latter of which is provided with a large canvas awning for the protection of passengers from the sun. Every attention has been paid to the ventilation of the ship, and the saloon is of

teakwood, walnut, and oak, with satinwood panels and fluted columns with gold capitals and mouldings. All the windows are fitted with glass bearing the crest of the company, venetian blinds, and shutters. The boat is fitted with the electric light throughout, and has a complete system of electric bells for both saloons. She is fitted with steam steering gear, steam windlass, Sir William Thomson's patent compass, and all the latest improvements for the rapid discharge of cargo, including a hydraulic crane. A company of about 50 ladies and gentlemen joined the *Monte Video* at Troon, after which she proceeded to Skelmorlie and ran the measured mile, the speed attained being equal to 13 knots per hour.

**Dalhousie.**—On October 30th this vessel, the largest and most powerful tug in the world, built by Messrs. William Denny & Brothers, Dumbarton, for the Clive Steam Towing Company, Limited, of Calcutta, underwent a trial trip, with most satisfactory results. Her dimensions are:—215 ft. by 32 ft. by 16 ft. 6 in. She is built of steel to Lloyd's class, and has water ballast for trimming her while towing. Her machinery, built by Messrs. Denny & Co., consists of two sets of compound surface-condensing engines, each driving a three-bladed screw. Steam is supplied by two large double-ended boilers, at a pressure of 100 lbs. per square inch. The weather on the 30th was exceedingly unfavourable, but, notwithstanding this, the result of four runs on the measured mile was a mean speed of 15.9 knots, an excellent result for a vessel of these dimensions. The towing apparatus has been supplied by Messrs. G. & J. M'Onie, of Greenock, and consists of two powerful steam capstans, placed aft in front of the towing rails. From these capstans the ropes are led round massive steel pulleys, and then led aft over the three towing rails to the vessel astern. These capstans can be worked either from the upper deck or from the bridge. In the event of anything happening to the principal towing apparatus, arrangements are made whereby the service can be taken up by a powerful steam windlass forward, constructed by Messrs. M. Paul & Co., of Dumbarton. From the capstan the rope is led aft through the alleyways, round a large bollard, and out through the side of the vessel. This was the method adopted for many years in Calcutta previous to the over-all system of towing recently brought into use. The vessel has been superintended during the latter part of her construction by Captain Taylor for the hull, and Mr. Aitken for the engines, these gentlemen being appointed by the agents in London, Messrs. James Wyllie & Co. The *Dalhousie* will also be fitted with a very powerful search light, which will be of great use in her peculiar service, and also several large sunbeam incandescent lamps for the deck work. In the event of the services of the *Dalhousie* being required for salvage purposes, she has been provided with a complete set of gear by Messrs. Drysdale & Co., consisting of a large upright boiler and a centrifugal salvage pump, both of which are made portable, so that, by means of a derrick on the foremast, they can be lifted out of the forehold, where they will generally be, and placed on board the vessel to be raised. They can also, however, be worked from the *Dalhousie* herself.

**June.**—On October 31st the Wilson liner *June*, which has been built for the Norwegian passenger and mail service by Earle's Shipbuilding and Engineering Co., was taken out for a trial of her engines. The *June* is not one of the largest of the steamers employed by Messrs. Wilson in the Norwegian trade, but she gave every indication that she will be an extremely handy and seaworthy ship.

**Jaederen.**—On November 5th the new screw steamer *Jaederen*, recently launched by the Grangemouth Dockyard Co., from their shipbuilding yard at Grangemouth, went down the Firth of Forth on her official trial trip. She obtained a speed of 9½ knots, which was considered satisfactory by all parties concerned. The vessel was built to the order of Messrs. Somme & Wattue, of Stavanger, Norway, and is of the following dimensions, viz.:—150 ft. perpendiculars by 24½ ft.; moulded depth, 12 ft. 7 in.; depth of hold, 12 ft.; with a deadweight carrying capacity of 550 tons.

**Barraclough.**—On November 5th this new steel screw steamer, built by Messrs. Ramage & Ferguson, Leith, for Mr. T. Barraclough, of the West Hartlepool Steam Navigation Co., went on her official trial trip on the Firth of Forth. The dimensions of this steamer are:—260 ft. k. and f. by 37 ft. breadth, moulded, by 19 ft. 5 in. depth, moulded; her net register tonnage being 1,306 tons, and the engines are triple-expansion, having cylinders 19 in., 80 in., and 51 in. diameter by 39 in. stroke.

The total deadweight capacity is 2,560 tons to Lloyd's load line, and on the trial trip a high rate of speed was attained with the engines working at 93 revolutions per minute. Everything worked most satisfactorily during the trial. After landing the owner and friends at Leith, the *Barracough* proceeded direct to Methil, where she loads a cargo for the Mediterranean.

**Angelus.**—On November 6th the new screw steamer *Angelus* left Bill Quay, on the Tyne, for a trial trip. The steamer, which is a finely-modelled vessel of 1,200 tons carrying capacity, has been built by Messrs. Wood, Skinner & Co., Bill Quay, for Mr. Burnett, Tynemouth. The engines, having cylinders 16 in., 26 in., 48 in., with a stroke of 33 in., have been built by the North-Eastern Marine Engineering Co., Limited, Wallsend, and during the trial ran with perfect smoothness. The speed of the vessel, fully laden, on the measured mile was exactly 10 knots.

**Barmen.**—On November 6th the steel screw steamer *Barmen*, built at the Walker yard of Sir W. G. Armstrong, Mitchell & Co., was taken on her trial trip. The vessel is built to the order of the German-Australian Steamship Co., of Hamburg, for their new line between Hamburg and Australia direct. The *Barmen* is 3,500 tons burthen, and is a sister vessel to the *Eiberfeld*, built by the same firm about three months ago. She is fitted with machinery on the triple-expansion principle by the Wallsend Slipway & Engineering Co., and has boilers working at 160 lb. pressure, which are fitted with forced draught on the closed ash-pit system. The *Barmen* made a series of runs on the measured mile off Whitley, when a mean speed of 12 knots was obtained with 78 revolutions.

**Cameroon.**—On November 6th the screw steamer *Cameroon* proceeded down the river for the official trial of her machinery, her engines having been converted from the compound to the triple arrangement by Messrs. David Rollo & Sons, of the Fulton Engine Works, Liverpool. The *Cameroon*, which is owned by the British and African Steam Navigation Co., is of the following dimensions:—Length, 302½ ft.; beam, 34 ft.; depth of hold, 24 ft. Her present cylinders are 21·84 in. and 56½ in. diameter respectively, with a stroke of 36 in. The vessel has two single-ended boilers of 13 ft. diameter, and 10 ft. in length, having 3,350 square ft. of heating surface, and it is intended to develop an indicated power of 1,000 horses at sea, under ordinary circumstances. Considerable improvements have been made in the steamer's hull. The main deck has been renewed, and an extensive bridge deck added, while the reduction in space required for the machinery has greatly increased the cargo capacity. Everything worked with the greatest satisfaction. The engines ran full speed with smoothness, while the readiness with which the vessel was handled ahead or astern formed the subject of complimentary remark. The average speed of the steamer was 13 knots, the machinery indicating about 1,200 H.P. There is thus reason to anticipate a career of increased usefulness to the *Cameroon*.

**Relampage.**—On November 8th the tug screw steamer *Relampage*, built to the order of Messrs. Pile & Co., London, by Messrs. Davis & McKendrick, was tried over the measured mile at Gareloch. A mean speed of 11 miles was attained, which was two miles over her guaranteed speed. Her dimensions are:—65 ft. by 14 ft. beam by 8 ft. deep. Engines 12 in. by 24 in. diam. and 18 in. stroke. Steam pressure, 100 lb.

**Arab.**—On November 8th the Union Steamship Co.'s steamer *Arab*, which has just been triplicated by John & James Thomson, had a private trial of her new engines, when an average speed of 15 knots was obtained with 3,500 I.H.P. Thereafter she sailed for Southampton to take her place in the company's intermediate service. When she is cleaned after arrival at Southampton and makes her formal trials, half a knot extra is expected to be obtained.

**G. R. Booth.**—On November 11th the s.s. *G. R. Booth*, a fine steel screw steamer, which has been built by Messrs. Raylton, Dixon & Co., for the Britannic Steam Shipping Co., Limited, Sunderland, proceeded from the Tees on her trial trip. She is built with raised quarter-deck, having a long bridge extending beyond foremast, and connected to forecable, forming partial awning deck. Her leading dimensions are:—Length over all, 306 ft. 3 in.; breadth, 38 ft.; depth, moulded, 22 ft. 10 in.; deadweight capacity, 3,690 tons. Her engines, which have been fitted by Messrs. T. Richardson & Sons, Hartlepool, of 190 H.P., with cylinders 22 in., 35 in., 59 in. by 39 in. stroke, gave great satisfaction on trial. She has been completed under the superintendence of Captain Parsons for her owners, and is commanded by Captain Leigh.

**Polo.**—On November 12th the new steamship *Polo*, built by Earle's Shipbuilding & Engineering Co., Limited, for Messrs. Thomas Wilson, Sons & Co., was taken on her trial trip. The compasses having been adjusted in the Hull Roads, the *Polo* was put on her course down the Humber to the measured mile at Withernsea. The engines being of a new type, and on the quadruple compound system, were very thoroughly tested. The average speed of four runs on the measured mile was upwards of 11½ knots, the engines working at full speed most smoothly and satisfactorily. The principal measurements of the *Polo* are:—160 ft. long between perpendiculars; 25 ft. beam; and 14 ft. depth of hold; with raised quarter-deck, bridge, and topgallant forecable. The engines are on the quadruple system, and have four cylinders (12½ in., 18½ in., 27 in. and 39 in. diameter respectively), with a stroke of 24 in., and steam, at 200 lbs. pressure, is supplied by a large steel boiler.

**Hercules.**—On November 12th the new steel steam tug *Hercules*, built and engined by Messrs. Vosper & Co., of Portsmouth, for the Shoreham Harbour Trustees, went on her official trial at Portsmouth, and attained a speed of 10½ knots, being 1½ knots in excess of the contract requirements, whilst the engines developed considerably more than the 200 H.P. stipulated for. Dr. Fuller, Chairman of the Shoreham Harbour Trustees, several other members of his Board, and the surveyors representing the Board of Trade and Lloyd's were present, all of whom were well satisfied with the result of the trial.

**Incharran.**—On November 15th this fine steel vessel, which has been built by Palmer's Shipbuilding & Iron Co., Limited, was taken out on her trial trip. The *Incharran* is 320 ft. in length, and has a deadweight carrying capacity of 4,750 tons. She is intended for the general cargo trade, and has been constructed to the order of Messrs. Hamilton, Fraser & Co., Liverpool. The engines, which are of the triple-expansion type, worked during the trial in the most satisfactory manner possible, the average speed obtained during several runs over the measured mile being 13 knots an hour.

**Humber.**—On November 16th the steamer *Humber*, the latest and largest addition to Messrs. William Sloan & Co.'s fleet of Clyde and Bristol Channel steamers went down the Clyde on her official trial trip. She has been constructed by Messrs. David J. Dunlop & Co., Engineers and shipbuilders, Inch Works, Port Glasgow, and is classed 100 A 1 at Lloyd's. Her principal dimensions are:—Length, 280 ft.; breadth, 32 ft.; depth of hold, 14 ft. 4 in.; and 400 tons gross register. The engines are of the three-cylinder type, adapted for a working pressure of 165 lbs. to the square inch of steam, the diameters being 21½ in., 34 in. and 57 in. respectively, by 42 in. stroke, and the power developed in the trials amounted to 1,300 I.H.P. Over a series of runs progressive to full speed, the *Humber* gave entire satisfaction, a speed of 12 knots being attained with the vessel in a partially loaded condition.

**Sallamut.**—On November 16th this vessel, which was launched a few weeks since from the building yard of Messrs. Schlesinger, Davis & Co., at Wallsend, was taken to sea for a trial of her machinery. The principal dimensions of the *Sallamut* are:—Length, over all, 382 ft. 6 in.; breadth, 42 ft. 2 in.; depth, moulded, 30 ft. 3 in. She is built on the three-deck principle, and has a full poop, a long bridge, and a topgallant forecable above the upper deck. Water ballast is carried in a double bottom, fore and aft, divided into several separate tanks, for convenience of trimming when the vessel is only partly laden. Four steam winches with independent boiler, steam steering gear, steam windlass, and all other modern arrangements for the easy manipulation of the vessel and her cargo are fitted, and altogether the *Sallamut* may be considered as a satisfactory example of the most complete type of cargo vessel. Accommodation for 16 first-class passengers is provided under the poop and bridge decks. The engines, of the triple-expansion description, have been constructed by the Wallsend Slipway & Engineering Co. The cylinders are 28 in., 46 in. and 75 in. diam., with a piston-stroke of 54 in. The boilers are double-ended, 13 ft. 6 in. diam. by 18 ft. 3 in. long, and work at a pressure of 170 lbs. to the square inch. The machinery worked with the greatest ease and handiness, and although running for several hours at full speed, not a drop of water was applied to any of the bearings. The speed of the vessel, ascertained by four runs over the measured mile, was found to average 12·15 knots per hour. The *Sallamut* has been built to the order of Hajee Abdool Latiff Baladina and Hajee Joosuby

Peerbhoy, of Bombay. The last named gentleman was present at the trial trip, and will return to Bombay in the vessel. Both hull and machinery have been constructed under the superintendence of Mr. James Casey, of London. The *Sallamut* will carry about 5,600 tons cargo and fuel on Lloyd's summer freeboard.

**Sicilia.**—On November 18th the steamer *Sicilia*, recently built by Messrs. Pickersgill & Sons, of Sunderland, on behalf of Messrs. Pierce, Becker & Ilardi, of Messina, completed her trial trip. This vessel is of the long bridge type, with poop and topgallant forecastle, and decks of chequer-plate iron. She is also fitted with cellular double bottom for ballast, with fresh water division for feeding the boilers, distilling apparatus, large donkey boiler, Harfield's steam windlass, the "Sentinel" steam steering gear, &c. She has superior accommodation for passengers and crew, her dimensions being 270 ft. by 37 ft. by 19.6 ft., moulded. The engines, which worked without the slightest hitch, are of the tri-compound type, by George Clark, Limited, with cylinders 21 in., 34 in., 56 in., and 89 in. stroke. They are supplied with steam by large sized boilers of 160 lbs. w.p., built under the inspection of Mr. David Meikler Reid, of London. The *Sicilia* was laden with 2,600 tons of coal, and steamed on the several runs a mean average of 10½ knots. The owner, Mr. W. F. Becker, was on board with Captain Schiaffino, also Messrs. Pickersgill, Clark, De Mattos, Swainston, Meikler Reid, and the usual staff from Messrs. Clark's works. The vessel has since sailed for Messina.

**Rex.**—On November 21st the screw tug *Rex* made her trial trip on the Thames, developing 230 I.H.P. with a mean speed on four runs over the measured mile of 10.221 knots. The hull, built by Messrs. Saunderson Bros., has a length of 72 ft., a breadth of 14 ft., and a depth of 8 ft. 4½ in., draft in working trim is 7 ft. 9 in. aft and 5 ft. 6 in. forward. The engines, built by Messrs. Young & Son, are inverted compound screw engines with cylinders 15½ in. and 28 in. diameter by 16 in. stroke, working at a pressure of 80 lbs. per square inch. The whole of the work was carried out to the specification and under the supervision of Mr. Henry Adams, M.I.C.E.

**Mariposa.**—On the 23rd November the screw steamer *Mariposa*, built and engined by Messrs. Blackwood & Gordon, Port-Glasgow, for Messrs. J. & A. Allan, Glasgow, went down the firth on her official trial trip. The speed was tested on a double run between the Cloch and Cumbræ Lights, and was in excess of what was expected, the vessel being loaded with coals for the passage out to the River Plate. The *Mariposa* is the first of two steamers, as well as two sailing schooners, now being built by Blackwood & Gordon for the Messrs. Allan, and intended for their increasing trade at the River Plate. Her dimensions are 153 ft. by 28 ft. by 9 ft. 6 in. She is built of steel to Lloyd's highest class, and has a deadweight carrying capacity of about 500 tons. The machinery is of the triple-expansion type, with large boiler of 160 lbs. working pressure, and is fitted with Morton's patent valve gear and all the latest improvements. She is also fitted with Napier's direct steam windlass and two of Napier's powerful steam cranes, with a radius of 23 ft. The steamer will leave in a few days for her destination, in command of Captain Walker.

**Joannis Millas.**—On November 25th the new steel steamer *Joannis Millas* proceeded from the works of Messrs. Joseph L. Thompson & Sons, Sunderland, on her trial trip. The vessel was run over the measured mile at Whitely, when a mean speed of 11.16 knots was obtained. The *Joannis Millas* has been built to the order of Messrs. J. Millas & Son, Braila, Roumania. She is of the following registered dimensions:—Length, 284 ft.; breadth, 38.15 ft.; depth, 18.15 ft., of the raised quarter and semi-awning deck type, and is constructed on the cellular bottom and longitudinal system to class 100 A at Lloyd's. The engines are of the triple-expansion type, having cylinders 21½ in., 35 in. and 58 in. diam. with a stroke of 39 in. They have been built by Mr. John Dickinson, of Palmer's Hill Engine Works, Sunderland, and are of about 1,000 I.H.P. There were present at the trial trip Mons. and Madame Millas, Mr. Lawes, who has superintended the construction of the ship and machinery on behalf of the owners, Mr. Robert Thompson, Mr. Fred. Dickinson, and Captain Gibson. Great pleasure was expressed at the satisfactory result obtained from ship and engines. After the trial trip she proceeded to Tyne Dock, where she will load for Antinople.

## Reviews.

*Reed's Engineer's Book.* (Thomas Reed & Co., 184, High Street, West Sunderland.)

We have before us a thirteenth edition of this well-known and valued text-book for information to marine engineers of the local marine board examinations, in which a large amount of subject-matter in diagrams, plates, and the latest requirements and modern questions in the Board of Trade examinations have been added by Mr. W. H. Thorn, the author.

The illustrative plates, amounting in all to 324 diagrams and 36 large plates, comprising drawings to scale of all the parts of marine engines, would appear to include almost every part of the marine engine delineated to scale, and examples of every subject that has ever been given, as a subject of question, or for drawing, in the Board of Trade examination.

We congratulate the proprietors of this old established and well-known text-book that they have so thoroughly recognised the necessity of constantly bringing their text-book up to date, as modern improvements and modern theories in engineering science are constantly on the march of progress.

It is to be much regretted that many text-books on engineering, written by old engineers of experience and responsibility, and published in a most expensive form, are now becoming almost obsolete by the progress of improvement, and the idea embodied in this text-book of condensing in a compact manner all information on a technical subject, such as that of marine engines, at a moderate price, and subject to constant revision and re-issue in successive editions brought up to date, is about the only serviceable means of affording literary knowledge to engineers of the details of their profession.

The subject-matter of this text-book contains, as a matter of course, all the general rules, features, and conditions of the Board of Trade examinations, which is afforded by very clear and yet simple instructions in arithmetic, such as is required for examination purposes, the problems used being all worked out in clear and sufficient detail. A considerable bulk of the following subject-matter are examples from examination papers and typical examples of general principles, as applied for calculation to marine engines. As all the fittings and parts to which the subject or problems refer are profusely illustrated with clear diagrams, the subject-matter is very fully explained, and clearly put.

There is also some careful work explained by numerous illustrations of various forms of indicated diagrams, a thorough knowledge and appreciation of which is so important to the engineer in his effective management and control of the steam-engine; and we find that the examples of faulty indicated diagrams are most practically accompanied with explanatory analysis, and the respective faults indicated by such diagrams are accompanied with short, pithy, and practical directions as to the proper course to be adopted in the adjustment of the eccentric or valve gear to remedy the defects indicated.

The whole preparation of the book, as regards clearness and excellence of type, and the diagrams and drawings, is very creditable to the publishers, as the comfort with which such a book is read, and referred to, depends very largely upon the care of the printer and publisher in the matter of type and diagrams.

**LAUNCH OF A LIFEBOAT.**—Messrs. Beeching, of Great Yarmouth, have just completed the building of a new lifeboat for the Gorleston Volunteer Lifeboat crew, to take the place of the lifeboat *Refuge*, which was capsized at the entrance to Yarmouth Harbour on the 18th November last, when four of her crew were drowned, the boat drifting on to the beach, and being rendered useless for further lifeboat service. The new boat is named the *Elizabeth Simpson*, after the lady who presented it, Miss Elizabeth Simpson Stone, of Norwich. She is said to be the largest lifeboat on the coast, and is made on the Norfolk and Suffolk lifeboat model, and not self-righting, the lifeboatmen at this port objecting to the latter type of boat. The dimensions of the *Elizabeth Simpson* are as follows:—Length, 47 feet; beam, 13 feet; depth, 4 feet 8 inches. The National Lifeboat Institution has nothing to do with this boat, she being for the volunteer crew, of which Dr. Godfrey Bately is secretary. The launching of the boat took place on October 23rd, from Messrs. Beeching's yard, and was witnessed by a large concourse of people.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

### FAST PASSAGES.

To the Editor of THE MARINE ENGINEER.

SIR,—If you can spare me the space, I should like to supplement the remarks made by "C. D." and W. F. Owens, in your last issue.

A more ridiculous letter than that sent to you by "Justice" was never penned, and in the following lines I shall endeavour to explain to all unbiased readers of the MARINE ENGINEER where, and how, an engineer's responsibility comes in. "Justice" argues that there is but one man on board a steamer upon whom responsibility and anxiety rests, and that man, the captain. Now, sir, I am perfectly prepared to admit that the marine engineering profession contains a few cantankerous spirits who wish to carry their heads too high, and are given to objectionable sayings and doings. Which, I ask, is the profession that does not possess some such members? Experience teaches me that there are few marine engineers at the present day who wish to withhold from the master of a steamer all the praise due to him for skilful seamanship and navigation. We all know that in foggy weather, or dangerous waters, his responsibility is increased by surrounding circumstances, but even then, it should not be forgotten, he relies wholly upon the machinery to extricate his ship from a dangerous position. How many "close shaves" and "near squeaks" does a steamer meet with in her lifetime, where the smart manipulation of the engines alone prevent a catastrophe? But these, O "Justice" are seldom heard of.

Supposing the *City of Paris*, *Teutonic*, or any one of our great liners, are steaming along a lee shore with a strong breeze. Something happens in the engine-rooms and the engines are stopped. What would it avail if every man on the ship's deck was an experienced captain? What could they do to save the ship? They might, it is true, let go the anchors and set sail; but the chances are a hundred to one that she would drift ashore like a sand barge. What of the responsibility on the head of an engineer, whose machinery meets with a mishap under such circumstances? He knows that his skill alone can save the ship. If she is lost, is the captain to blame? I say, No. It is owing to the machinery being stopped and the failure of the engines to rectify the mishap in time. A great many people say, "It's the engineer's duty to keep the ship going; that is what he is paid for." Just so; if the engineer's duty is so great, then his responsibility must be great as well, for the above remarks apply to ninety-nine out of every hundred steamers afloat, if placed in a similar position; sail is becoming more and more a thing of the past, and reliance placed entirely on machinery, but the above is but one instance of an engineer's responsibility.

One of our Atlantic greyhounds is leaving on her maiden voyage. After leaving Queenstown, the captain knows that he has two thousand miles of water to plough through, with nothing in the shape of land to pick him up. A diligent watch is kept on the bridge by certificated officers, and trustworthy men keep a look-out in the "crow's nest." Unless he encounters a fog and runs his vessel full speed through it, or the remote chance of a collision, I should like to know where his terrible responsibility comes in, until he makes the land again. "Justice" says, "His the constant care." Are not the engines constantly running, and are not the following a few of the hundred and one troubles an engineer has to combat—leaky condensers, boiler, or boilers that will not feed, bearings that require constant watching to prevent heating, bilges full of chips, rivet bags, and the usual new ship etceteras, joints giving out here and there, and what not, for we all know what the stereotyped report of a trial trip—"the engines ran with remarkable smoothness"—really means. Compare the lives led by the captain and engineer during this period. The engineer knows that

unless the difficulties are overcome, insignificant as they may appear to the uninitiated, a fast passage will never be made, and that he—and he alone—will be brought to account when the ship returns; hence it is not an uncommon occurrence for a chief engineer to remain for twenty-four hours at a time in the engine-room, and from the time the ship leaves Liverpool, until she arrives at New York, never obtain more than two or three consecutive hours rest. Still we are told, that the captain is the man who makes the fast passage!

"Justice" appears to think that so long as the keys of the safety valves are in the hands of the captain, no fear of a catastrophe happening to the boilers or machinery need be apprehended. Poor, misguided man! It is an astonishing fact, Mr. Editor, but there are thousands of men who entertain the idea that so long as they can hear the screw revolving, or gaze down the engine-room and watch the engines working, there cannot be anything wrong below; they hear the clank and rattle of the machinery, and take these sounds to be the necessary accompaniment to the working of the engine. Why, every click is telling its tale to the engineer, whose quick ear tells him whether his services are required, and where to look for the fault. After all, sir, it is perhaps as well that those on deck are not aware of what is taking place down in the grimy depths, amongst the blazing furnaces and mighty machinery; for I am inclined to believe that there are times when they would not turn in with the contented mind they might otherwise possess. So far as the locked safety valves are concerned—well—engineers of the merchant service, please don't smile, and don't ask your captains what they have done with the keys, because you know perfectly well that you may as well ask them to solve the mystery of the sphinx.

I wonder if "Justice" has ever been in the engine-room of a ship at sea, in a gale of wind, when every rod, bolt, and pin, is tested to its utmost capacity; careful handling of the engines prevents a breakdown, which would mean, in the case of most deeply-laden merchant steamers, the loss of the ship and (probably) all hands. I think about five minutes of such experience would satisfy him as to responsibility resting on the engineer, and that a berth, which enabled him to put his watch in, behind the "dodger," on the bridge, preferable at half the money.

I should like those who are continually running down engineers to make a voyage to the East Indies on board of a steamer with bad boiler-tubes. Fancy asking one of them to go in the back end of a boiler that had just been blown down, with the thermometer in the stokehole standing at 145 degrees Fahrenheit. Yet chief and junior engineers are entering these earthly hells every day, out of which they are often dragged, after a few minutes' work, in a senseless condition. In one steamer that I wot of, after several days' hard work in the Indian Ocean, the three engineers dropped from sheer exhaustion on the stoke-hole plates, but the work must be done or the voyage will never be made. Then there is the pleasure of a few days' bilge diving. Up to your waist, sometimes neck, in filthy water, dashing you from side to side against the pipes and framing, until every bone in your body aches. Oh! it's a pleasant life, is that of a marine engineer. Just go below, order the firemen to raise steam, open a few valves, pull a few handles, give her a drop of oil now and then, and there you are, don't you know!

The remarks made by "Justice," anent the captain bringing a steamer to port, after an irreparable breakdown at sea, are equally absurd. All who watch such cases, know that for one steamer which reaches a port by the aid of her sails, twenty wait until another comes along and tows her there. *That's* how they arrive at port, dear "Justice."

If another instance of an engineer's responsibility is needed, let me advise "Justice" to study the report sent home by that noble specimen of a British sailor—Captain Kane, of H.M.S. *Calliope*, after the memorable escape of that vessel. Here is an instance where a captain—one in deed as well as name—was too honourable to withhold from his engineer praise for the great part he played on that historical occasion.

In conclusion, let me say that I am one of those who wish the day had come when friendship between deck and engine-room was the rule and not the exception. We all know what a miserable place a ship is, when wrangling is ever rife. We should all thank you, Mr. Editor, for your efforts on our behalf. Keep pegging away, sir. Marine engineers must, sooner or later, be placed in the position their training and responsibility entitles them to claim. It is inevitable, for shipbuilders are

viewing with one another to turn out steamers, depending for the smallest necessity upon the skill of that much abused individual—the engineer.

I am, Sir,

Yours faithfully,

FAIR PLAY.

P.S.—Some may say that in the above, I have only depicted the dark side of an engineer's life; but there is such a side, and in this I defy contradiction.

To the Editor of THE MARINE ENGINEER.

SIR,—I read with interest and considerable admiration the letter anent "Fast Passages" in your October issue. Which to admire most—the ingenuity displayed in picturing the captain's position, or the extremely flowery style of the whole letter, I can't settle in my own mind; but "'Tis he who keeps the headlong pace, and his constitution has to pay the price," reads and sounds very brilliant, and if original the construction of such a sentence is at least worth admiring, and is a credit to "Justice's" literary ability. The letter is written in a style calculated to mislead your readers (who may not be members of the maritime profession) as to the position and duties of engineers. The *sarcastic* allusion to the winchman is a very neat thing, but in answer to that I might say the driving of the winches has a *great deal* to do with the quick discharge of a ship. Somehow, I don't think "Justice" is a sailor; if he is, he is either wilfully blind, or woefully ignorant. Take your position at a hatch, and see what is the most important factor in the arrangements for discharging—the winch—and it lays in the power of the winchman to render this piece of machinery useless for a time. If he does so, what becomes of your quick discharge?

I do not wish for one moment to take any praise from the captain that may be justly due to him, but that he should be lauded up and given the entire credit is not justice, although it may be according to the very peculiar light "Justice" has thrown upon the subject. Let me ask how it is that in a steamer which has been built at a great cost, loaded to a certain pressure, &c., &c., it is not usual to make a record the first trip? Is it because the captain's anxiety will not let him force the ship? Does not the telegraph stand at full speed ahead all the time (except in case of fog, when the ship is *supposed* to slow down, but as to that there is generally an understanding between captain and chief engineer)?

It shows supreme ignorance on the part of "Justice" to say that so long as the pressure is kept up the engineers are doing their duty, and failure to keep up the pressure is failure in duty to owners, constructors, and masters. There are circumstances which occur in the engine-room or stokehole which many times make it necessary to reduce the pressure and slow down the ship, and in the event of such a thing happening the captain would be politely told to mind his own business if he interfered. The chief engineer is answerable to the Board of Trade for the safe working of his engines and boilers, and for any accident or defect which may occur below, his certificate is at stake, and it would little avail him to plead captain's orders or no responsibility before the Board of Trade.

A new racer comes out, the engineer's instructions are, drive her all you can compatible with safety, and as he wishes to thoroughly feel his job he may not fully force the engines (consequently the ship) the first voyage, he finds room for improvement in various portions of the machinery, all tending in the direction of safety, acceleration of speed, and economy, till in a voyage or two we read, Captain Blank may be congratulated on having made the fastest passage, &c., although he has done nothing but slow down in case of fog, keep on the course laid down for him by his company, and his ship clear of collision. I don't ask for all the credit, but in justice the engineer should be heard of a little more in connection with these fast passages.

Hoping that some more able pen than mine may take up the subject,

I remain, yours truly,

REASON.

#### FORCED DRAUGHT.

To the Editor of THE MARINE ENGINEER.

SIR,—Having seen in your issue of November 1st a report of a paper upon "Forced Draught," read by Mr. Williams, at a meeting of the Institute of Marine Engineers, of October 19th, I hope you will allow me to supplement the same with a few remarks.

The paper, though interesting as a record of Mr. Williams' experience, was not as complete as it might have been made. It did not give a record of the blast pressures in the furnaces of the steamers mentioned, neither did it contain a review of the efforts and inventions of those who have made forced draught to marine boilers easy of appreciation; therefore, much new light was not thrown upon the subject. The earliest practical application of artificial draught to marine boilers of high-pressure during the last half century, according to my experience, was made about the year 1843 by Mr. Edward Slaughter, Engineer of the Avon-side Engine Works, Bristol, who designed and constructed two fast screw steamers, the furnaces of which were capable of burning as much fuel per foot of grate bars as any locomotive boiler of the period, and both boilers and engines were of a lightness equal to the modern torpedo-boats with exhaust draught, the engines were direct-acting and capable of running at 240 revolutions per minute.

Although this was accomplished at such an early period, nevertheless, it was the only kind of artificial draught *used* of any intensity in steam yachts, tugs, steam launches, and all the earlier torpedo-boats.

The great and increasing requirement that torpedo vessels should be able to remain some time at sea, made it impossible for them to carry sufficient fresh water for feed, and necessitated the condensation of the exhaust steam hitherto used for producing the draught.

For the first requirement, Samuel Hall's invention—the surface condenser—lay ready to hand; but the necessary draught was not so easy to obtain, and the weight of the boilers of the locomotive type could not well be increased.

Several attempts had been made in America to accelerate the draught by using powerful currents of air projected into the open ash-pits, so at this juncture experiments were made in this country to revive the practice; and a fan pressure of as much as 12 inches of water was tried with nozzles of various kinds and shapes, but the result, even with this pressure projected into the open ash-pit, was very little better than the ordinary draught.

All this was, of course, very disappointing, therefore torpedo-boat builders were fain to adopt the hitherto neglected invention of Mr. S. E. Fletcher, engineer, brought out about the year 1853 or 1854, to obtain the necessary draught by passing the stokehold under a pressure of air, by closing it with the stokers under hatches with air-tight bulkheads and doors. By this plan a rate of combustion has been obtained of 100 lbs. *more* per foot of bar than by any ordinary marine-boiler with a natural draught, and this plan has been adopted in some costly ships in Her Majesty's Navy. This plan of forced draught, with a closed stokehold, must be carefully applied and cautiously used to effect an economy of fuel, and the greatest vigilance is necessary with a high rate of combustion in using it to prevent undue wear and tear of the boilers, and in some instances partial destruction of the same by contraction of tube-plates, &c., caused by the inrush of air from the plenum in the stokehold on opening the fire-door, as experience in its application have fully proved.

The defects of this system suggested to many the desirability of the direct introduction of the pressure of air into a closed ash-pit, but their trials were failures, as when the pressure in the furnace exceeded that of the external atmosphere the flames and gases escaped round the edges of the furnace doors when closed, and in large volumes when they were opened for firing.

No successful attempt was made public to overcome these difficulties until the year 1883, when I who had for a long time previous to that date perfected an invention to remove them, and to apply forced draught of *any* pressure of air direct to a closed ash-pit, and so enable a pressure of air to be maintained (in the furnace) above the atmosphere to any required extent.

I exhibited it in London, fitted in its simplest form to a Cates' and Haward's patent marine boiler at the Engineering Exhibition in 1883, and fully described as a considerable invention in forced draught in the MARINE ENGINEER of that date.

A full description was given daily of it at the Exhibition, and drawings shown, and the advantages of this system of forced draught described to engineers and others.

By the use of Cates' equilibrium fire-door all escape of gases under pressure from the furnace round the fire-door was prevented and if there could be any slight escape it would be that of cold air; no such accidents as an inrush of air against the inside of the furnaces and tubes, or an outburst of flame on opening the fire-door could occur, as the various automatic connections w

(shown and explained at the time by various drawings) would instantly shut off the blast, and it was shown to be impossible for the door to be opened from any cause without closing the blast, but the door may be closed, and the blast remain off at pleasure; but when on, the action becomes automatic; and the effect of drawing the air by the fan from the stoke hold and engine-room would be the prevention of heat accumulating therein. Thus was the problem solved of applying forced draught to a closed ash-pit with a plenum in the surface by the publishing of my invention and drawings, and the descriptions of which were at the time sent to the Admiralty.

In the same year, 1883, Messrs. Willans, of Thames Ditton, brought out an original and successful invention in a different form, by a casing over the door; it was successfully applied in the same year to the steam yacht *Brenda*. Thus by either of these two inventions was forced draught with an open stoke-hold with a pressure of air or gases in the furnace above the atmosphere made possible and easy.

All that has been done by others since that date has made the appropriation of one or the other of the last two described inventions necessary for them, but thinly-disguised by injurious and an unnecessary additions.

Leaving the merits of the veils of these appropriators to their patrons to decide upon respectively, as to whether they would prefer their air warmed, or their combustive chambers comfortably cooled by the admission of air into the interior of the same through hollow stays in their back water spaces,

I am, sir,

Yours obediently,

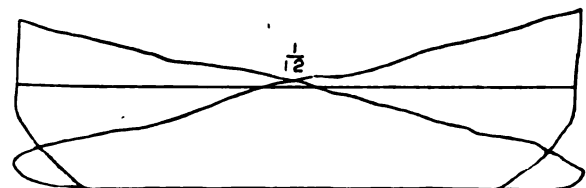
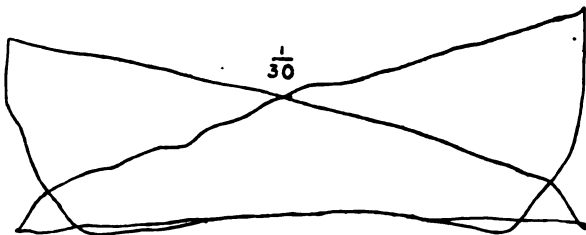
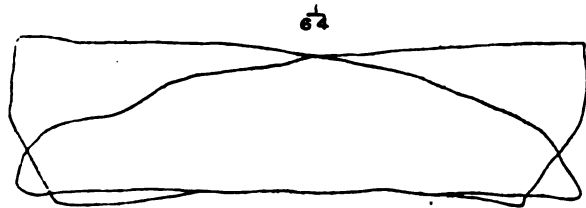
G. A. CATES.

Bristol, November, 21st, 1889.

#### TRIPLE-EXPANSION ENGINES.

To the Editor of THE MARINE ENGINEER.

SIR,—The papers published in your paper on the *Meteor* experiments were the most instructive I have read on the triple-expansion engine, and must have been read with great pleasure by your subscribers. The astern-going diagrams show very distinctly the advantage of a change in the rotation of the cranks.



22°	36½°	60°	39°	Stroke.
1	2.75	7.438		Ratio of Cylinders.

I think the readers of your paper would benefit each other if they would give their experiences with triple expansion engines.

The enclosed copies of diagrams are taken from an engine built on the North-East Coast, and are, I think, a very favourable specimen. The cranks are set 1, 3, 2, as the diagrams show.

The results are as follows:—

Mean Press.	I.H.P.	Per Cent.		
59.3	284.146	29		
27.55	363.972	38		
9.45	336.692	33		
	<hr/>			
	984.810	100		
Steam.	Vac.	Revs.	Speed.	Consumption.
145	23	64	9.4	15

The load carried was 3,600 tons. The speed and consumption are taken from an average of 25 days. The coal was a mixture of English small, Belgian, and Welsh.

Sunderland.

D. R.

### Miscellaneous.

**FAST STRAMING FROM THE CAPE.**—The Union Company's Royal Mail steamer *Moor*, which left Cape Town on October 16th, at 5.10 p.m., *via* Madeira, arrived at Southampton at 5.50 a.m. on November 3rd, her gross passage being 17 days 12 hours 40 minutes, and her net steaming time 17 days 9 hours 12 minutes; the distance run being 6,008 miles, giving an average speed of 14.41 knots per hour over the whole course.

We understand that Mr. R. O. Ullstrom, M.I.N.A., has resigned his position as Chief Draughtsman and Assistant Manager to Messrs. Raylton, Dixon & Co., Shipbuilders, Middlesboro'-on-Tees, and now becoming a partner in the firm of Messrs. Crompton & Compton, Marine Engineers, &c., and that the firm will now be Crompton, Ullstrom & Compton, Practical Marine Engineers, Naval Architects and Ship Surveyors, 19, Gracechurch Street, London, E.C.

**NEW VESSELS OF THE "APOLLO" TYPE.**—Preparations are now being made in both the Chief Constructor's office and the Chief Engineer's office at Devonport Dockyard, in connection with plans for the erection of three new vessels of the *Apollo* type. The vessels are to be named the *Eolus*, *Astræa*, and *Bonaventure*. They will be twin-screw sheathed steel cruisers, 300 feet long and 43 feet broad, with 3,400 tons displacement. There is every probability that all three vessels will be engined by the Keyham Factory.

**FASTEST ON RECORD FROM THE CAPE.**—The Union Steamship Company's Royal Mail steamer *Mexican*, which left Cape Town 32 minutes past 5 p.m. on October 30th, arrived at Southampton at a quarter-past 11 a.m. on November 17th, and has made the fastest passage on record between Cape Town and Southampton. The distance run was 4,987 miles *via* Madeira, and was accomplished in 17 days 17 hours 43 minutes gross time, the net steaming time being 17 days 8 hours 21 minutes, giving an average speed over the whole distance of 14.3 knots per hour.

**THE CHANNEL ISLANDS SERVICE.**—A Southampton correspondent states that the London and South-Western Railway Company have ordered three steamers of the newest pattern and fastest speed to be placed on their Channel station, with the view of competing with the Great Western steamers from Weymouth.

**BRITISH ENTERPRISE IN THE EAST.**—The Scottish Oriental Steamship Company, Limited, have contracted with the Fairfield Shipbuilding and Engineering Company, Limited, for the building of two steel screw steamers of 1,650 tons gross register, and 1,600 I.H.P., for their China trade. These vessels are to be fitted with all the latest improvements.

We understand that the directors of the British Marine Salvage Company, Limited, of Glasgow, have decided to establish an East Coast Station at Leith, and place some of their powerful centrifugal steam pumps there. It is understood that arrangements have already been made with a leading engineering firm at Leith for the accommodation of the appliances.

Messrs. Scott & Co., shipbuilders, of Greenock, have secured the contract to supply triple compound engines and boilers for Her Majesty's ship *Hercules*. They are to drive a single screw and to be of 8,500 H.P. When completed they will be fitted on board at Portsmouth.

**Recent applications for Patents connected with  
Marine Engineering, Ship Construction and  
Mechanical Appliances for use in Ships from  
October 19th to November 15th, 1889.**

- 16280 W. P. Thompson. Ventilating.  
16345 R. Miller. Multi-tubular vertical boiler.  
16404 E. Dönitz. Packings for pistons and piston rods.  
16420 E. Bond. Sea anchor.  
16424 W. Balch. Discharging life-saving and other rockets.  
16452 F. Hocking. Making fresh water from salt water.  
16455 J. Jones. Covers of manhole and similar openings.  
16526 C. Douglas and M. Douglas. Steam winches.  
16551 E. K. Ryan. Cleaning metal plates and ship bottoms.  
16561 G. F. Simonds. Thrust and other bearings.  
16602 R. H. L. Wheeler. Propulsion of boats.  
16607 H. H. Lake. Propelling vessels (A. W. Case, U.S.A.).  
16616 E. J. Hill. Convertible deck seats.  
16624 W. E. Parkes. Ventilation of ships' cabins, berths, &c.  
16631 A. Locher. Sea calming by discharging oil upon it.  
16666 W. P. Thompson. Slide valves (Herman Dirk Haverkamp, Holland).  
16675 W. S. Barwick. Ventilation apparatus for ships, &c.  
16676 N. Weber. Firemen's or stokers' shields.  
16730 J. Hall. Steam and water separators.  
16737 G. H. Steinbach. Coupling vessels.  
16765 T. M. Rymer-Jones and J. Westray. Ventilation of ships.  
16771 N. Arthur. Automatic ships' freeing port.  
16793 T. G. Broughton. Raising steam in locomotive and marine boilers.  
16811 M. Kuhn. Link motions for compound engines.  
16828 R. Bruce. Marine engines.  
16851 Tangyes, Limited, and J. N. Floyd. Exhaust steam condenser.  
16858 F. W. Brewster. Connecting and disengaging ships' boats to and from the davit tackles.  
16859 T. W. Brewster. Rafts.  
16874 A. J. Loftus and A. G. Angier. Lamps and lanterns, &c.  
16896 W. E. Kochs. Shipping coal.  
16933 A. Beldam. Fire bars.  
16967 W. P. Hoskins. Ships' berths.  
17044 W. W. Girdwood. Quadruple-expansion engines.  
17139 T. Tanner. Indicating apparatus for ships.  
17181 J. Cousins. Apparatus for perfect combustion in steam boiler furnaces and flues.  
17251 A. Hunnab. Ships' boats.  
17303 H. H. Chilton. Ships' berths.  
17323 A. McConwell. Jointing the ends of packing used for manhole doors, &c.  
17428 A. J. Boulton. Signals for use on ships (A. Gartner & Carl August Noack, Germany).  
17487 J. Haas, jun. Screw propellers for vessels.  
17540 B. Ray. Ships' propellers.  
17578 C. R. Winn. Sight-feed lubricators.  
17592 W. P. Thompson. Propulsion and steering of vessels (Arthur Casella, jun., France).  
17709 G. F. Redfern. Propulsion of ships (Jean Jacques Mathé, France).  
17755 R. W. Atkinson. Thrust blocks for screw propeller shafts.  
17848 F. H. Wilks. Ventilators for ships.  
17853 W. W. Beaumont and J. Kirkaldy. Condensers and distillers, water heaters and coolers.  
17884 J. Hagen. Loading and unloading coal or other vessels.  
17891 A. F. Yarrow. Tubular boilers.  
17931 J. Hay. Stoppers for boiler tubes.  
17958 A. F. Yarrow. Water tube boilers.  
17986 A. Gibb. Pitting of propeller blades.  
17999 G. F. Simms. Anchors.  
18038 J. H. Hall and J. Verity. Thrust blocks of screw propeller shafts.  
18056 R. Brotherhood. Naval construction.  
18103 F. W. Durham and E. S. Hough. Packing for stuffing boxes.  
18124 G. J. Stevens. Screw propeller for ships.  
18206 W. P. Bullivant. Attachments for connecting booms for supporting torpedo nets to the sides of vessels.  
18237 A. Leckie. Cranks for compound steam-engines.

**BOARD OF TRADE EXAMINATIONS.**

NOTE.—1 C, denotes First Class; 2 C, Second Class.

**EXTRA FIRST CLASS.**

October 26th, 1889.

Hackett, John E., Extra 1C Leith.

November 9th, 1889.

Stevens, William T., Extra 1C South Shields.

October 26th, 1889.

Arundel, A. Jas. 1C Hull  
Blackaller, T. H. B. 2C London  
Boyce, A. .... 2C Liverpool  
Brodie, Wm. .. 1C "  
Butter, John .. 2C "  
Cashin, T. .... 2C Plymouth  
Clouston, Jas. .. 1C London  
Coggon, F. Wm. 2C Hull  
Evans, Owen .. 1C Liverpool  
Gray, Chas. H. 2C Hull  
Johnson, Wm. .. 2C London  
Milne, David .. 1C N. Shields  
McGarthy, Jno. 2C "  
McLachlan, F. G. 1C Hull  
North, John C. 1C Liverpool  
Pearson, W. G. 2C N. Shields  
Porter, John .. 1C Hull  
Ramsey, John. .. 2C N. Shields  
Sharples, John 1C Liverpool  
Simonsen, C. H. 2C London  
Smith, A. Grove 2C Hull  
Smith, H. Lee. .. 2C "  
Wright, James. 2C South'tn

November 2nd, 1889.

Atchinson, J. H. 1C Cardiff  
Blackwood, A. C. 1C Glasgow  
Bourke, Chas. .. 2C "  
Brewer, Chas. .. 2C "  
Brown, Lachlan 1C London  
Chapman, A. H. 1C Cardiff  
Courts, Wm. C. 1C Plymouth  
Cullen, Daniel. 2C Glasgow  
Hamilton, Hy. 2C Liverpool  
Harris, Geo. A. 2C London  
Henry, R. Jas. 2C "  
Jones, Thos. W. 1C Cardiff  
Laing, Arch. .. 1C London  
Leitch, Arch. .. 2C Glasgow  
McDonald, J. S. 2C "  
Morrison, Chas. 2C Liverpool  
Muir, Jas. .... 2C London  
Neilson, John .. 1C Cardiff  
Nixon, Robert. 2C Glasgow  
Pearson, Chas. E. 2C Cork  
Richards, E. E. 2C Liverpool  
Roberts, David 1C Glasgow  
Ross, Wm. .... 2C "  
Shoott, T. J. J. 2C London  
Smith, Jas. .... 2C Glasgow  
Smith, Wm. .... 2C "  
Sudden, A. .... 1C Liverpool  
Ward, Wm. C. 2C London  
Watson, Alex. .. 2C Liverpool  
Watson, R. W. 2C "  
Welsh, Jas. .... 1C Glasgow  
Wright, Jos. .... 2C London  
Xydias, Geo. A. 2C "

November 9th, 1889.

Alexander, A. .. 2C Leith  
Ballingall, Thos. 2C "  
Baxendale, E. B. 2C Liverpool  
Bell, Anthony P. 1C "  
Bertie, John .. 2C Leith  
Blake, Wm. H. 1C "  
Brow, Thos. .. 1C "

Camilleri, Andw. 2C London  
Charleson, Geo. 2C Leith  
Clarke, Wm. H. 1C "  
Edwards, Jos. .. 1C London  
Elliwood, Wm. J. 2C Liverpool  
Evans, John W. 1C London  
Gamilleri, Andw. 2C "  
Goninan, A. .... 1C "  
Heron, Jas. .... 2C N. Shields  
Jeffcott, John E. 1C Liverpool  
Kilpatrick, John 1C Leith  
Lowe, Charles .. 2C Liverpool  
Mallingall, T. .. 2C Leith  
Melville, John. 2C "  
McLean, Alex. .. 1C London  
Parren, John G. 2C Leith  
Porteus, Wm. .. 2C N. Shields  
Potts, Cuthbert I. 2C "  
Proven, Geo. .... 2C Leith  
Roberts, L. D. .. 2C Liverpool  
Scott, Wm. H. .. 1C N. Shields  
Scudder, G. W. 1C Liverpool  
Sees, John .... 2C "  
Shannon, R. C. 2C "  
Simpson, D. L. .. 1C Leith  
Sproat, James .. 1C Liverpool  
Stevens, Benj. .. 2C Leith  
Stewart, Robt. 1C Liverpool  
Thomson, John 2C London  
Treasurer, A. W. 1C Leith  
Trudder, G. W. 1C Liverpool  
Waugh, Jas. .... 2C N. Shields  
Wens, Wm. .... 2C "  
Westwood, C. .. 1C London  
Williams, G. F. D. 1C Liverpool

November 16th, 1889.

Bell, Wm. .... 1C Greenock  
Blackwood, J. T. 1C N. Shields  
Bonner, Geo. .... 2C Greenock  
Booker, Alfd. .... 2C "  
Cambridge, J. T. 2C W. H'rtpl  
Cockburn, B. .... 2C N. Shields  
David, G. W. .... 1C Dundee  
Dodds, Walker 1C Greenock  
Farrel, Edwd. .. 1C "  
Foekard, F. H. 2C London  
Fulton, Wm. J. 2C Greenock  
Handy, Isaac O. 2C N. Shields  
Harding, G. J. W. 1C Hull  
Hendry, John .. 1C Dundee  
Inverarity, T. D. 1C "  
Jame, Arthur .. 2C N. Shields  
Laird, Sam. M. 2C Dundee  
Mather, Alex. R. 2C "  
McLean, Jas. .... 2C Liverpool  
Nixon, Robert. 2C "  
Page, John .... 1C Dundee  
Patterson, Chas. 2C Hull  
Penkeyman, W. J. 2C Liverpool  
Richardson, D. 1C London  
Rowson, J. T. .... 2C Hull  
Salmond, G. L. 1C N. Shields  
Scawn, Alfred .. 2C Plymouth  
Smith, James .. 2C Greenock  
Stratford, J. R. .. 2C Hull  
Taylor, U. .... 2C N. S.  
Thompson, C. N. H.  
Walton, Wm. .... 2C "

# The Marine Engineer.

LONDON, JANUARY 1, 1890.

**T**HE annual general meeting of the Peninsular & Oriental Steam Navigation Company that has just taken place, Mr. T. Sutherland, M.P., presiding, was full of most interesting subject matter. The company's history of the past years shows that they have passed through some considerable crises. The opening of the Suez Canal rendered the greater part of their fleet quite unsuitable for the new conditions of commercial trade with the East; however, they practically reconstructed it, even at the sacrifice of their immediate profit, out of a sinking fund; and, in consequence, have secured for themselves now a position of unusual soundness. The reduction abroad of stocks of coal, stores, and repairing yards, which has been found to be a consequence of the increased speed of connection effected by the Suez Canal, has now enabled the company to carry on their enormous business with a considerably reduced capital, and it is therefore proposed to return a large proportion of the capital to the shareholders. With regard to the trade of the last twelve months, we are sorry to note that the increasing trade which was so noticeable in the first six months of the past year has not been fully maintained in the second half. They have, however, to congratulate themselves that they have practically replaced their old fleet with vessels on the latest improved principles, and with the most modern economical machinery. The Chairman was of opinion that they have saved £300,000 on the past ship and engine-building contracts as compared with present prices, and they are now fully determined not to build more for the present than will suffice to cover their regular waste and depreciation of the fleet. Their last year's earnings appear to have been on the whole of a very satisfactory nature, and the company find themselves able to declare a dividend of 8 per cent., and to put aside £40,000 to a temporary reserve, which, considering the increase in the coal bill, is not unsatisfactory. It is satisfactory to hear that they are now able to utilise local coal at many of their foreign stations, not only in Australia, but in China and Japan, from local and native supplies. Though the freight traffic shows a lull after the first six months of the year, it is difficult to explain the reason of this, without it is that the increasing exports do not go in proper proportions to the East as compared with other markets. The company have

the satisfaction of knowing that the passenger traffic is still steadily on the increase, the increase this year being nearly £50,000 upon the last year. The Chairman reports that he finds there are one million tons of shipping under construction at the present moment, and likely, he fears, to be in excess of the requirements of trade. If, however, the return of present prosperity were to be fairly maintained for the future, the shipping now constructing would be more than absorbed. The company have much to congratulate themselves upon, in so far that they have now completed a perfect and modernised fleet in so favourable a condition of the manufacturing market. It must also be remembered that their last year's earnings have been considerably affected by the very serious strike, and the consequent paralysis of their business, for a time during last summer. In conjunction with the proposed return of 20 per cent. of unnecessary paid-up capital, the company proposes to convert the remainder into a preferred and deferred stock, the preferred to bear a cumulative 5 per cent. dividend. The suggestion seems to have been well received in the stock market, as the shares have risen in value. The old fleet which they have now replaced must have cost them at the rate of £50 per ton, and they have now replaced it at a much larger tonnage and at probably half that cost. They are also now feeling the practical diminution of subsidies, formerly paid to them by Her Majesty's Government, which have been materially reduced by about £250,000 per year. In conclusion, the whole meeting showed a very satisfactory and sound financial position of the company which, in the face of great depression of business and very special troubles, and with an entire modernisation of its fleet, has successfully emerged in so brilliant a manner at the first sign of prosperity.

**T**HE Institute of Marine Engineers has signalled its first year of existence by a conversazione given at the Town Hall, Stratford. The entertainment was a great success, and no doubt the sympathy and interest of a great number of the external public have been thereby acquired in the welfare of the institute. There is no doubt that a social entertainment of the character given is a wise and politic move. A large company of ladies and gentlemen seemed thoroughly to enjoy the entertainment given, which consisted of a good programme of music and song, irrespective of dramatic effort. More substantial mental food was provided by short addresses

delivered at intervals by gentlemen connected with the institute. Mr. A. Beldam, the president, was very warmly received, and impressed upon his hearers the benefits likely to accrue to marine engineers from the reading of papers at the institute, and the great interchange of experience which is likely to follow from social meetings and chit-chat amongst themselves. He claimed for marine engineers, that they were one of the most influential factors in the spread of trade and commerce, and claimed for them a high relative standing amongst the other professions. The secretary, Mr. James Adamson, said that many interesting and valuable papers had already been read since the founding of the institute, and that there were many more in store for the future. The junior members of the profession were particularly urged to join the society as they would thus be brought into direct contact with their seniors, from whom many valuable hints could no doubt be obtained. Mr. H. E. Lester made a short amusing address on the subject of honorary members, which elicited much amusement and interest. In the course of his address he expressed a hope that the institution would soon have a hall of its own, where its members might meet as in a club, and where papers might, from time to time, be read, and entertainments, such as the present, might be given. This is an excellent idea, and would no doubt be supported heartily, not only by the members themselves, but by their friends, and by shipowners and others interested in the profession. We should be glad to see such a project put promptly into a practical shape, in which, perhaps, our aid for publicity and support might be useful, which we should be very pleased and ready to accord. We are very glad to see that the nucleus which led to this undertaking has been so substantially supported, and has so successfully carried the institute to a powerful and influential position. The society's record has been thoroughly successful for the first year of its existence, and we have no doubt it will soon attain a position that will make it a representative institute of all that is successful, and useful, in the profession of Marine Engineering.

THE compilation of the shipbuilding returns suggests a very serious question as to whether building is not proceeding too rapidly, if so, the present course would tend once more to depreciate the shipping trade by over-competition in freight. It is well known that the tonnage of vessels built in the United Kingdom was ~~larger~~ at about a period of six years ago than in any

subsequent years; but the then depreciation in freight served to stop the demand, and to render many yards idle. The steady increase of sea-borne traffic as a whole, together with the average annual waste and loss of vessels, seems now to have absorbed any surplus ships that may have been idle, and prices of building having been exceptionally low, have conducted to make a brisk demand for ships under such advantageous conditions. Should, however, the late increase of trade be maintained in the same ratio as heretofore, the present rate of production may not be in excess, and may be absorbed by the trade. Seeing, however, that the cost of materials and labour are steadily rising, or have risen considerably, this in itself will serve as a partial check, since a steamer can produce profit where the cost is low; but it might not be possible for it to do so at an increased cost of 25 or 30 per cent. Seeing, therefore, that orders which have been placed, and are being executed, are on a scale of greater magnitude than in any preceding year, and that the loss of vessels has been rather lighter than of old, there would seem to be some danger of a repetition of a check to the trade as six years ago. It is probable, however, that the many contracts now being placed in private shipbuilding yards for ships of war, will have a certain effect in checking over-production of vessels for commercial purposes. Should the demand for commercial vessels continue in the present ratio, it would appear that the builders will be able to stand out for more increased prices than those at present in vogue. As all the steam vessels now building have the latest economies in high pressure and high expansion, with considerable average increase of speed, this may serve to enable shipowners to live profitably even at lower freights than at present are general.

#### ON TRIPLE-EXPANSION ENGINES AND ENGINE TRIALS.

AT the meeting of the Institution of Civil Engineers, on Tuesday, the 10th of December, the President, Sir John Coode, K.C.M.G., being in the chair, the paper read was "On the Triple-Expansion Engines and Engine Trials in the Whitworth Engineering Laboratory, Owen's College, Manchester," by Professor Osborne Reynolds, LL.D., F.R.S., M.Inst.C.E.

The modern theory of the steam-engine, as founded on the discoveries of Joule, had rendered the experimental investigation of it one of the most important and most interesting branches of science. This theory revealed in the most certain manner the objects to be aimed at in designing engines, as well as the results to be expected; but only experimental investigation of the engines showed how far these results had been realized, and to what circumstances any failure in such realization must be attributed. For this purpose, ordinary steam-engines, doing ordinary work, were about as good as ordinary animals, in their ordinary occupation, were for subjects of physiological

experiment. In certain particulars both could be accurately observed, as, for instance, how much coal or food was necessary during the performance of a particular operation; but to ascertain how all the separate organs were performing their several functions was impossible with an ordinary steam-engine, without subjecting it to a species of mutilation which left it about as fit to continue ordinary work as an animal that had been the subject of physiological study. By the patient expenditure of great ingenuity in adapting measuring instruments to the engines, as well as by securing provisions, during the construction of the engines, for the use of these instruments, much had been done. Engines of every class had from time to time been subjected to experimental examination as complete as practicable, and the knowledge thus gained was of immense value, although it left much to be desired. It had been found by these experiments that the actions in the several organs did not even approximately conform to the simple primary actions aimed at; but that the primary were obstructed by secondary actions, which in some cases amounted to as much as 40 or 50 per cent. of the total action. The analysis and evaluation of the secondary actions thus revealed, although recognised as objects of primary consideration in engine trials, were still very incomplete, demanding for attainment engines much more fully adapted to the purpose of the experiment than those hitherto available. It was evident that the engines and apparatus for operating upon should be such that each organ, while similar to, and performing the part of, the corresponding organ in an ordinary engine, should be so arranged with respect to the other organs as to admit of the manner in which it performed its part being completely gauged; and that this should be simultaneously with all the organs, both those corresponding to the ordinary engine and such special organs as should be introduced to admit of access to the others, so that the action of these latter might be accurately discounted. The engines in the Whitworth Engineering Laboratory had been throughout specially designed and constructed with a view to the fulfilment of the foregoing requirements. The Committee, consisting of Mr. John Ramsbottom, Mr. John Robinson, and the author, having, after consultation with Mr. William Mather, been released from all considerations of expense, felt that a great opportunity would be lost if the facilities offered were not taken advantage of to the utmost; and unless every effort was made so that the engines, while as far as possible representing in their principal members the most approved existing practice in steam-engine construction, should be thoroughly available for experiments on the use of steam throughout, and, if possible, beyond the range hitherto attained in practice. If this was accomplished, not only would appliances, costly almost beyond the range of private effort, be secured, but the conduct of what would otherwise be a very expensive and laborious research would afford the most desirable work for the laboratory—work which, having all the advantages of reality, would yet afford the students the best possible opportunity, while acquiring facility in the use of the instruments and methods of reduction, of gaining an insight into the action of each part of the engine. There were three separate inverted-cylinder engines working on separate brakes, having the following dimensions:—

Engine.	Cylinder.		Crank-Shaft Diam.
	Diam.	Stroke	
No. I. (high-pressure) .....	5	10	2½
No. II. (intermediate) .....	8	10	2½
No. III. (low-pressure) .....	12	15	4
Air-Pump on No. III. ....	9	4½	
Feed-pump „ .....	1½	2	

All the engines had their cylinder walls and both covers separately jacketed, and so arranged that they could be worked with or without steam in any or in all of the jackets. Each engine was designed to carry a pressure up to 200 lbs. on the square inch, to run at any piston-speed up to 1,000 ft. per minute, and had expansion-gear to cut off from zero up to 0·8 of the full stroke. One engine was furnished with a surface-condenser having 160 square feet of surface; the other two engines were furnished with alternative exhausts, either into the atmosphere or into steam-jacketed receivers supplying the next engine, each receiver having an alternative supply of steam from the boiler. The boiler was of the locomotive type, with 5 square feet of grate, 200 square feet of heating-surface, and

carried 200 lbs. of steam per square inch. It was set in a hot chamber, with an economiser having 50 square feet of heating-surface, of which an area of 40 square feet was kept clean by scrapers, and was so arranged that the gases moved in the opposite direction to the water. The furnace was worked either with chimney-draught or with forced draught on the closed stoke-hold system, and burnt fuel up to 160 lbs. an hour. The speciality of the system consisted, mainly, in the provisions made to render possible the accurate determination of the manner in which each part performed its work, as well as to make the performances of each organ, as far as practicable, independent of the performance of the rest. To accomplish this, the boiler and three engines had been separated by intervals of 20 ft., 7 ft., and 12 ft., and the steam distributed by five systems of pipes, while the engine-shafting extended over a length of 36 ft. This spreading out of the engines entailed greatly increased radiation and additional friction. These quantities, however, being differently measurable, did not confuse the results. The investigation, commenced in March, 1888, had been continued at the rate of two trials a week during the Session, a trial occupying six, four, or two hours, and being conducted as regular work in the laboratory. As the trials were intended eventually to cover all possible systems of using steam, each system was fully investigated in a series of trials, giving consistent results, before proceeding to another system. After the first twenty-four trials, a scheme was drawn up, commencing with a series of trials of triple-expansion at 200 lbs. boiler-pressure per square inch, with and without steam in the jackets. This series, involving thirty-two trials, was commenced in October, 1888, and completed in April, 1889. Several trials were made at each speed, and the results were found to agree within 1 per cent., so that three trials with steam in the jackets and three without were taken as illustrating the results obtained. The conditions under which this series of trials had been made were, if anything, more favourable to economy than any which prevailed in practice; and although the purpose of these engines was to elucidate the causes of inefficiency rather than to realize the utmost economy, yet it was very desirable that the results obtained should not, whether on account of the comparatively small sizes of the engines, or from other causes, fall greatly behind what might be expected from high-class engines in actual practice. Hence it was eminently satisfactory to find that notwithstanding the drawbacks already mentioned, the economic results compared favourably with anything yet obtained in practice, even with the largest engines. The lbs. of coal and of water per I.H.P. per hour were:—

	With Steam-Jackets.	Without Steam-Jackets.
Coal—Total .. .. .	1·50 to 1·33	1·81 to 1·62
Discounting radiation	1·30 to 1·21	1·77 to 1·54
Water—Total .. .. .	14·10 to 12·63	17·30 to 15·90
Discounting radiation	12·30 to 11·90	16·60 to 15·10

Although these results were extremely good, the sources and extents of the various losses were clearly shown. Thus, of the total heat received by the engines exclusive of radiation, with jackets 19·4 per cent. had been converted into work, and without jackets 15·5 per cent.—the greatest amount which would have been converted had there been no secondary actions being 23 per cent.; so that with steam-jackets there were losses through secondary actions amounting to 17 per cent., and without jackets to 34 per cent. The manner of the distribution of these losses was also apparent. One important source of loss, which with jackets accounted for 5 per cent. of the loss, had been brought to light for the first time. This was the heat carried away from the surfaces of the cylinder and passages, in consequence of the expansion after release. The effects of cylinder-condensation were clearly shown in the mean diagrams taken from the trials. Although these trials were not in themselves sufficient to determine anything like a complete law of this action, they exhibited in a striking manner its dependence on certain circumstances. One circumstance in particular, which had not previously received much attention, was here shown to be of primary importance in the action of steam-jackets. These diagrams showed that with the temperature of steam in the jackets of No. 1 engine the same as that of the initial steam, the effect of the jackets on the cylinder-condensation was very small. In No. 2 engine, with 80° Fahrenheit difference in the temperature of the jackets and that of the initial steam, the condensation was reduced from 30 per cent. to 5 per cent.; and a difference of temperature of 190° Fahrenheit between the jackets and the initial steam in engine

No. 3 entirely prevented condensation. Thus, in these trials, with steam at boiler-pressure in the jackets, low-pressure diagrams had been obtained, apparently for the first time, in which the curve of expansion coincided exactly with the curve for saturated steam.

## INSTITUTE OF MARINE ENGINEERS.

A CONVERSAZIONE was held in the Town Hall, Stratford, on Friday, December 6th, in connection with the Institute of Marine Engineers. The hall was decorated for the occasion, and a most interesting collection of models, photographs, engravings, &c., were artistically arranged on either side of the hall. Amongst others of the members' exhibits we observed several beautifully-finished models of Newall's patent high speed engines and other specialties; model and photographs of steamer and engines by J. Stewart, of Blackwall Iron Works; models and photographs illustrating Nixon's white metal packing; W. Reid's patent specialties; Ruthven's water-propulsion; Joy's valve gear; the Boaz-tube stopper; Leslie's roller bearings for shafts; Beldam's packing and pump valves; Whittle's valve adjuster; Norton's valve motion; Churchill's governor; also a model of a compound engine fitted with the attachments, &c. Amongst the models of engines—of which there were several—one lent by Messrs. T. Skinner & Co. was specially worthy of attention; specimens of Dewrance's patent safety-gauge glass connections; Messrs. Crompton & Crompton's castings, &c.; asbestos and other patent packings; &c., by Bell's Asbestos Co.; also a few fine cases containing specimens of electric light and telegraph wires, and other articles manufactured by the Silvertown India-rubber and Gutta-percha Co. Amongst many photographs and engravings worthy of special note were several lent by the Editor of the *Engineer*; Mr. W. J. Craig (manager of the Victoria Graving Dock and Pontoons Co.), and others. Considerable attention was directed to a very fine microscope and objects exhibited by Mr. Slight, also to several instruments exhibited and explained by Mr. J. McF. Gray, and a fine astronomical model and diagram illustrative of the motions of the earth, sun and moon, lent by Mr. Jesse Nimkey, F.R.A.S.

During the evening the Meiter Family gave selections of music. Singing and music by members and friends; two recitations by Mr. A. Wieland, reading by Mr. Craig, and a farce entitled "Chiselling," by an amateur party, were rendered with occasional intervals for conversation, fruit, and refreshments.

After tea, the PRESIDENT (Mr. Beldam) referred to the great importance of engineering in developing the resources and advancing the trade of the world, benefiting the merchant and consumer alike by giving facilities for the rapid and economic manufacture of goods of all kinds on shore, and for their speedy and economic despatch by sea. He was proud to reckon himself an engineer, and he felt it an honour of no mean kind to occupy the position in which he had been placed as President of the Institute of Marine Engineers.

The HONORARY SECRETARY gave a brief and forcible address, in which he referred to several interesting features in connection with the rise and progress of the Institute. First, the interest manifested by the ladies in their visits to the reading-room on occasional evenings and in their abiding visit that evening, lending their pleasing features to the many other encouraging proofs that the Institute was progressing in its work, gaining and commanding confidence as it proceeded. Next, the warm and approving sympathy of the press, exhibiting by many proofs a confidence in the objects and aims as well as the practical outcome of the labours of the promoters, which he trusted nothing would mar, but that everything done in the future would tend to strengthen and maintain. He exhorted those present to do what they could to induce the junior engineers and young men coming out as engineers to join the association. Referring to the many temptations surrounding their opening careers, he urged that they should make the choice between the helps and hindrances to their advancement in life, pointing out in emphatic language that the Institute would prove a most effectual help. Although pressing the claims of membership on the juniors, he mentioned that, however paradoxical it might appear, the numerical gain to the Institute was greater by far than the financial by the admission of Associates and Graduates, their payments being

small, at the same time the aims and objects of the Institute were far beyond the scope of finance and its calculations. He advocated that every man should study some subject in his leisure moments as far removed as possible from his own special business in life, on the principle that one who devoted his whole attention to one subject became too much one-sided, using the analogy of a tree which spread forth its branches to one quarter, and withheld them from another, thus lacking symmetry and grace. The tri-part nature of man was alluded to, and the necessity of cultivating all the elements which go to make up the character was pressed, especially in the cases of those on the threshold of the business of life as engineers, thus they would maintain the honour of their cloth, and attain to the dignity of true manhood.

Mr. H. E. LESTER gave an address on the subject of "Honorary Membership," and seemed to advocate that it might be well worth the consideration of the council whether they should not admit ladies as honorary members. It was generally understood that honorary members subscribed to the funds of the Institute according as they felt disposed, and probably ladies might be admitted to the privilege of contributing within a range of £1 to £100 per annum, thus obtaining the dignity which had been conferred on himself. He felt very much in the position of a certain student of divinity, who, as his turn came, had to preach a sermon from a subject to be given to him at the time in order to encourage impromptu speech; the subject of Zaccheus was given and he began his sermon by stating that Zaccheus was a short man, and so was he; Zaccheus was up a tree, and so was he; Zaccheus quickly came down and went away, and so should he. Mr. Lester dwelt upon the noble aims and objects of the Institute and its members, and said that in his opinion it was an excellent means provided to all engineers of educating themselves and of becoming acquainted with the leading members in their own line of life, thus being benefited socially. In closing, he hoped that the cherished wishes of the members of council would be fulfilled, and that soon the Institute would have a building of its own, as he understood from the Honorary Secretary that he had some plans and intentions in this direction, having class-rooms, model-rooms, reading-room, and probably, he might add, the smoking-room would not be forgotten.

Amongst others present were several of the local aldermen and councillors, the Rev. Alex. and Mrs. Jeffry, Mr. J. McF. Gray, and several of the Board of Trade Surveyors; Mr. Wilkinson (Lloyd's Surveyor), Capt. Hutchinson (Marine Supt. B. I. S. N. Co.), Messrs. T. Auckland (Lloyd's Underwriter), D. Joy, J. D. Churchill, A. W. Robertson, Wm. Reid, W. White, S. C. Sage, the Supt. and Assist. Supt. Engineers of the P. and O. and B. I. S. N. Co.'s, Telegraph & Maintenance Co. (Mr. Crook), New Zealand Shipping Co. (Mr. Campbell), Thames Iron Works (Mr. Wiltshire), Shire Line (Mr. Hudson), and other lines; Messrs. W. G. Neal (the *Marine Engineer*), W. Longstaff (*Newcastle Chronicle*), J. Johnston (*Fairplay*), and other representatives of the press, and many well-known and local men.

The proceedings of the evening were brought to a close about 11 o'clock by the Meiter Family playing "Auld Lang Syne," and the assembly of ladies and gentlemen was dissolved, after spending a most pleasant and sociable evening, a result which ought to be most gratifying to the promoters and well-wishers of the Institute.

## SIR C. PALMER ON TRADE.

SPEAKING at Jarrow-on-Tyne, on Thursday night, Sir C. S. Palmer, M.P., said that the forecast of the coming year which he was able to offer the locality was one that he might congratulate them upon. The works of his firm were extending day by day, and they were employing more men day by day. The wages which were distributed weekly were increasing. Notwithstanding the introduction of the enormous amount of machinery for the purpose of labour saving which they had adopted, their wages had gone up, and now amounted to nearly £12,000 per week. So far as the coming year was concerned, the commercial requirements would certainly occupy them during the most of next year. It was true that they had not entered upon high speculative prices, but they had taken contracts at fair and reasonable prices for the purpose of bringing trade to the works. They had taken an enormous contract with Her Majesty's Government. That contract was for the building of two of the largest battle-ships yet built, and he

need not say that Her Majesty's Government had shown great confidence in the work that they could accomplish in Jarrow by giving them two of those ships. There was no record of such a thing having been done in a commercial place before. That work would occupy them about three or four years. He thought it was a matter of great congratulation to Jarrow that for certainly three or four years there was a substantial foundation for the employment of a large number of the working-classes. No matter what reaction in trade might occur, they had at least before them orders of that important character as a sort of standard. There were people who would say they had made a plunge, and had taken these orders at too low prices. They knew the capabilities of Jarrow. The high prices that were prevalent, or might become prevalent, would not exist for ever, and therefore they were content with the prices that they had obtained. He hoped there would be no jealous feeling on the part of those who had not been successful, but that they would all wish them well in the undertaking. But some persons had over-rated that work. He heard that it had been said on Tyneside and in the North of England that the amount which would be required for wages was upwards of £2,000,000. He wished to correct that inflated statement. The amount of wages for these two vessels that would go to the workmen would not exceed £500,000. They must remember that there was a very large portion of the material of the vessels which they brought from other quarters—armour plates from Sheffield, and such-like material. Therefore, while the contract was one of great magnitude, the expenditure for labour would not exceed the amount he had named. This prosperity which he fore-shadowed for the future would in a great measure depend upon the working-classes themselves. He did hope that the good feeling which had always been exhibited to the working-classes by those who controlled their great works never wishing to drive wages down to the lowest point, might be continued, and that it might not be attempted to drive wages up to the highest point. He felt that the working-classes were fully entitled to receive a fair share of the prosperity and success of the times, but he hoped that while such large contracts were being carried forward the working-classes, and the employers too, would consider conciliation rather than have strikes and lock-outs, which were a barbarous and uncivilized way of dealing with such questions. The works had been largely extended. Large steel works had been erected, and these, with furnaces which they were building, would give employment to a large number of men. He approached a question which was more difficult, and concerning which it might be said it was foolish to prophecy unless one knew something beforehand. He had said that the work which was in progress in Jarrow had not been taken at the highest prices. He believed that to have been the fact with nearly every industry in the North of England. He believed that they were based upon prices—and he was speaking of shipbuilding—that existed previous to the inflated prices that were now quoted. How was the trade conducted? Freights rose, and shipowners were at once induced to embark capital in building ships. That was the first beginning. The shipbuilder was basing his calculations upon fair and moderate prices in advance of what they might be at the time according to his own opinions. But as soon as the shipbuilder had made the contract he covered himself by buying his material. Therefore, so long as the contracts were not delivered they might be assured that materials were being delivered at fair and moderate prices during the time the ship was being built. It was true that wages had risen, and he believed there was scope for a rise in wages. But when they came to the speculative part, it was then that shipowners came forward, and ordered work at these high prices. We were building in this country at the present time about 1,000,000 tons of shipping, and the normal waste or loss was about 400,000 tons, leaving a surplus of 600,000 tons as an addition to our Mercantile Marine. The advancing trade of the country, and the increasing population, would require many hundreds of thousands of tons more. The time had therefore come when freights might fall a little. Shipowners would therefore wait, and there would be a reaction, inasmuch as they would not place their orders at the highest prices. He might be a pessimist upon these points, but he fancied that would be the course of events. Long contracts were a necessity, but, as a rule, they were to be deprecated. He hoped that the working-classes would take advantage of this period of great prosperity, and that they would be thrifty and lay aside a certain amount of their wages, and not be wasteful.

## SIGNALLING AT SEA.—EARL'S DISTRESS SHELL.

THIS shell is the invention of Mr. Reginald Heber Earl, of St. John's, Newfoundland, who has protected it by letters patent in the United States, Great Britain, France and Canada, and is designed to supersede all distress signals at sea now in vogue, inclusive of flag and gun.

The instrument is an oblong cylindrical shell 17 in. in length, on the top of which is a screw nipple, with a detonator attached and fitted with a brass cap. The lower part of the cylinder contains a chamber of about one-third of the entire length, containing a charge of two-and-a-half pounds of Dupont's I.F. sporting powder, which is the only explosive used. Above this chamber is an air cell, passing through which are two small tin tubes, one being used to charge the shell, the other containing the fuse connecting with the nipple on the top. The whole instrument when ready for service weighs less than five pounds. The shells are intended to be lodged in convenient places on vessels, particularly on the bridge with the captain, and when a distress signal is necessary the cap of the nipple is unscrewed the nipple scratched, similar to scratching a match, which ignites the fuse, and the shell is then thrown overboard, this is done in seconds. After the shell strikes the water the fuse burns for fifteen seconds before explosion, then a sharp shrill crack is heard, followed by a deep sonorous, tremendous, penetrating roar, forcing the water, smoke and fire into the air to a height of upwards of a hundred feet. The charge of powder in the bottom of the shell causes it to assume an upright position in the water, and being submerged two-thirds of its length, the water affords an excellent resistance to the expansion of the powder in the explosion. The instrument employed in the night is of the same construction but having a rocket attached, which is driven by the force of the explosion, high into the air, and there explodes itself, distributing over a considerable area a brilliant light of sufficient duration to enable neighbouring vessels to view the situation.

Mr. Earl, the inventor—who, by the way, is a jeweller by trade—and Mr. Edwin B. Woods, of Wall Street, New York, rowed out into New York harbour, opposite Governor's Island, recently, and exhibited the instrument. There was a brisk wind blowing and the water presented a rough and choppy surface, which was considered an excellent test. Two shells were thrown overboard, the second a few minutes after the first. Thrown upon the water, they at once took the position indicated above, posed there for a moment, then suddenly exploded with a tremendous report, which must have been heard quite a distance away. A column of water, smoke and fire ascended in the air, resembling a miniature blowing up of Hell Gate. The report elicited from the neighbouring water craft an unlimited screeching of steam whistles, and the strange sight of water, smoke and fire rising into the air drew quite an assemblage to the edge of the Battery, and a second trial was witnessed by a large crowd.

## CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

THE first ordinary meeting of the Civil and Mechanical Engineers' Society for the new session was held at the Westminster Palace Hotel, on Wednesday evening, December 4th, when Mr. Henry Adams, M. Inst. C.E., Professor of Engineering at the City of London College, delivered his opening address. After alluding to the responsibilities which the presidential chair involved, he reviewed the work of the society during the past year, indicating the chief points of merit in the papers which have been read, and using each as the text for some practical remarks. With regard to technical education he laid down the qualifications for good engineering draughtsmen, and said that although the supply was commonly thought to be greater than the demand, every engineer at times found considerable difficulty in getting competent assistants. In describing the visits made by the members, reference was made to the City and Southwark Subway, the Locomotive and Carriage Works of the London and South-Western Railway Co., and Messrs. Kirkaldy's Testing Works and Museum. In connection with the visit to the London and South-Western Railway Works, the president gave some results obtained with

the vortex blast-pipe, of which he is joint inventor and patentee with Mr. W. Adams, the locomotive superintendent. By its use this railway company alone has saved nearly £50,000 on its coal bills, in addition to reaping other advantages. The work of the council was alluded to, and a recent alteration in the rules of the society admitting engineering pupils without entrance fee. The position of the society financially was stated to be sound, and a hope was expressed that the roll of members would be largely increased during the coming year. Looking beyond the limits of the society, the state of the labour-market called for some remarks, and in this section the president concluded by saying, "Unionism is the right of all, intimidation an outrage upon the first principles of liberty and justice." The chief features of the three most memorable structures of the day, the Forth Bridge, the Paris Exhibition, and the Eiffel Tower, were described and many interesting particulars given, and the address, which was well received throughout, was brought to a close by an exhortation to the younger members of the profession, who possessed opportunities undreamt of by former generations, but these very opportunities called for corresponding zeal on their part, "to whom much is given of him much shall be required."

### LACQUER AS A PRESERVATIVE OF SHIPS' BOTTOMS.

THE Japanese newspapers publish an official report by the captain of the Russian frigate *Dimitri Donskoi* on lacquer as a preservative of ships' bottoms. In the latter part of October, 1887, the frigate put into the Yokosuka Docks for the purpose of having her bottom examined and cleaned. After the water had been drawn off, it was discovered that the entire steel line along her keel was so completely corroded that not a trace of paint could be discerned. The outer surface of the iron plates was found to be in a honeycombed condition, due to large numbers of shell-fish; and this was more particularly observable along the water-line. Acting on the advice of some Japanese engineers who were well acquainted with the action of the electric current generated by friction between the various kinds of metal used on ships, it was decided to adopt the lacquering process, which, although an invention of recent date, had already given satisfactory results. Not only the steel but also the zinc portions were lacquered. Though the lacquer was intended to minimise the action of the electric current on the zinc, its power of adhesion to the zinc sheathing was found to be very slight, and consequently its durability and preservative properties were greatly impaired. After the lapse of a month from the ship's departure from the dock, the lacquer completely peeled off the zinc sheathing, and in six months the rate of speed of the frigate became perceptibly lessened. In October, 1888, the frigate put into dock at Yokosuka a second time, and an examination revealed the fact that the lacquer on all the steel portion was in an extraordinarily good state of preservation, so much so that it could not be stripped off except by being scraped with a sharp-pointed instrument. The corrosion of the steel once removed, the lacquer possesses the property of preserving it in that state without being affected with corrosion itself. The general appearance of the corrosion presented, on observation, remarkable inequalities. One part may be badly corroded, while another may escape corrosion altogether. On scraping the foul part of the lacquer with a sharp instrument and removing all the varnish, the lacquer underneath was found to be still preserved in its original state and to be adhering strongly to the iron plates. The results of this lacquering as compared with that of the previous year were highly satisfactory, and it is therefore not too much to claim that the great efficacy of lacquering to counteract corrosion has been conclusively established. Taking the Japanese war vessel *Ryogo Kan* as an illustration of the lacquer experiment, it is found that lacquering is sufficient to render the action of the electric current ineffective. The steel plates were therefore lacquered, and it was decided to substitute iron on the part where zinc had been used. Lacquering was first used on iron ships in Japan in 1885, after which the Government decided on getting all the bottoms of their iron ships lacquered, so that up to this the experiment has been tried scores of times and the efficiency of the process tested over and over again. The virtues of lacquer for this purpose have long been recognised in Japan; but the above is stated to be the first report on the subject from a foreign naval expert.

## NAVAL ARCHITECTURE AND MARINE ENGINEERING.

### III.—CLYDE FIRMS.

(Continued from page 367.)

Messrs. William Simons & Co. also exhibited a model of their patent elevating steamers for elevating purposes and for transporting carriages, waggons, passengers, and general traffic. The platform elevates to suit the rise and fall of the tide, rendering steps unnecessary. One of these steamers is being constructed for the Clyde Navigation Trustees, to be employed at Finnieston, Glasgow Harbour, in connection with the cross river service. The following are the principal dimensions of the vessel:—Length, 80 ft.; breadth, 43 ft.; depth, amidships, 12 ft. Its distinctive feature is an elevating deck (besides the ordinary deck), which extends the whole length of the vessel, and occupies about half its width. The hull is constructed of steel, and the deck underneath the elevating platform of iron, and the sides beyond the platform of thick pitch pine planking. In case of collision, the hull is divided into 13 watertight compartments by longitudinal and transverse bulkheads. The rise of the platform or deck is fully 14 ft. from its lowest position; it is 78 ft. long, 32 ft. in extreme breadth, of which 19 ft. in width is set apart for vehicles, and a width for passengers on each side of about 6 ft. For embarking and landing the traffic, on each end of the vessel is fitted a suitable gangway, shod with strong iron plate, which will be raised and lowered by means of chain pulleys and hand wheels placed conveniently amidships. The vessel will be capable of carrying about 300 passengers and eight loaded carts and horses, or if passengers only, 600 to 700. The propelling machinery, which is located amidships, consists of two independent sets of surface condensing triple-expansion engines of the most recent type, each set to be coupled with its own line of propeller shafting, running fore and aft, and each shaft to carry two propellers, making four propellers in all, i.e., two at each end of the vessel. The I.H.P. of the propelling engines will be about 400 collectively. Provision has been made so that in the event of either set of engines becoming disabled, the remaining set will be able to work the vessel. Steam will be supplied from two horizontal tubular boilers of 150 lbs. working pressure, fitted with John Brown & Co.'s patent ribbed furnaces. The engines for raising and lowering the platform will be a separate set of surface condensing triple-expansion, similar in type to those for propelling the vessel. The air and circulating pumps will be worked by separate engines, as these are necessary, owing to the short time the vessel is under steam each trip. Special precautions have been made to ensure as far as possible the obviating of noise, on account of the horse, &c., traffic for which the vessel is intended.

Messrs. Fleming & Ferguson, Phoenix Works, Paisley, were exhibitors of dredgers, and their stand was also rendered attractive by a number of photographs of vessels and engines they have constructed, including the quadruple-expansion engines, specially designed and patented by the firm, as fitted in the s.s. *Singapore*, which in the October, 1889, number of the *MARINE ENGINEER*, were fully described and illustrated.

The models exhibited include one of the screw steamer *Auckland*, a combined dredger and hopper, which shows the vessel to be fitted with Messrs. Fleming & Ferguson's patent arrangement for traversing the bucket ladder forward, so as to enable the dredger to make her own flotation. This traversing gear is worked quite independently of the dredging gear proper, by a pair of auxiliary engines—an advantageous arrangement as compared with the ordinary method of connecting the traversing to the main dredging gear, as it is not an uncommon occurrence during dredging operations for the main gearing to be damaged; and if at the time the bucket ladder was projected in a falling tide, there might be serious straining and damage, owing to the dredger settling down on the bucket ladder. With this improved type of hopper dredger, fitted with steam appliances for readily opening the doors of the hoppers, dredging can generally be executed at about half the cost entailed with stationary barge-loading dredgers. With stiff sand and clay the cost of dredging and discharging is under one penny per ton. One of the photographs represents the twin-screw dredgers *Gilberton*, *Walter Bibby*, and *Preston*, which were constructed for the Corporation of Preston, and were employed in deepening the river Ribble. These dredgers were specially designed of great strength and have been successfully employed in dredging the river channel, which consisted of red marl and

boulder clay, a character of bed which in other instances on the same coast has required to be blasted before being dredged, but which these dredgers have cut and raised at the rate of 800 tons per hour. A photograph of the self-propelling barge-loading dredger *Gladstone*, was also exhibited. It was built for the Wick Harbour Trustees, and is a very handy size of dredger for narrow rivers and channels. The bucket ladder projects beyond the bow of the vessel, so as to enable the craft to make its own flotation. Both sides of the *Gladstone* are braced and held firmly together by the framing, so making the vessel perfectly seaworthy, and capable of bearing the strains due to regularly taking the ground, an operation carried out once every twenty-four hours without the least damage to the hull.

Another photograph represents the dredger *Velez Sarsfield*, of which Messrs. Fleming & Ferguson are now building a duplicate for the contractors for the Manchester Ship Canal. These dredgers are also, like the *Gladstone*, made with an open well at front, and bucket ladder projecting to enable them to cut their own flotation. In the photograph the dredger was shown as rigged for the voyage to Buenos Ayres, with the ladder stowed on deck, and the well covered in and used as a coal bunker for holding coal for the voyage out. The *Velez Sarsfield* made the voyage from the Clyde to Buenos Ayres in 42 days.

Messrs. Fleming & Ferguson's exhibits were not, however, confined to those illustrations of dredging. A model of the screw steamer *Skeandhu*, a handsomely-designed yacht, built by the exhibitors for Mr. Sholto D. C. Douglas, Coatbridge Castle, near Glasgow, constructed of steel, coming in for considerable admiration. The special feature of this vessel is that it is fitted with Messrs. Fleming & Ferguson's Patent Quadruple Engines (of 130 I.H.P.), which, owing to their breadth of base and lowness of centre of gravity, are so specially suited for craft of this type, where vibration is so objectionable. The speed attained by the *Skeandhu*—10½ knots per hour—is very satisfactory for the size of vessel and power of engines.

A photograph of a larger steam yacht, the *Grace Darling*, built for Mr. J. Carberry Evans, was also exhibited. This vessel, which is lighted throughout by electricity, was also fitted with the firm's patent quadruple-expansion engines, indicating 350 H.P., and giving a speed of vessel of 12½ knots per hour.

Messrs. Wm. Denny & Co., Dumbarton, had only one exhibit, viz., a well-finished model of the quadruple-expansion engines of the s.s. *Buenos Aires*, and on pages 358 and 368 of the December number will be found a full illustrated description. No other Clyde shipbuilding or marine engineering company had exhibits on view than the five already enumerated.

## PORTLAND v. BITUMINOUS CEMENT FOR PROTECTING SHIPS.

THE most commonly approved medium for protecting the interior surfaces of ships has long been a mixture composed of Portland cement and sand—substances in themselves of high specific gravity, but often rendered doubly weighty by careless and ill-advised application. Through a natural desire to reduce structural weight, and thus effect a gain in dead-weight carrying capability—a desire rendered the more natural through a consideration of what the substitution of mild steel for iron has effected in this direction, and almost made compulsory, by reason of recent load-line legislation—shipowners and builders have in recent times been directing their attention to restricting the quantity of cement concrete in their vessels. So much so has this been aimed at, and so little has been the attention directed to other and lighter protective substances, that in many cases the thinness of the Portland cement coating has afforded but a questionable protection to the coated surface. Although seemingly impervious to the eye, cement concrete, as applied to vessels' bottoms and bilges, is always more or less porous, and numerous cases might be cited in which water has been unexpectedly found to have lodged and spread itself over the whole of a vessel's bottom between the skin and the cement coating. When the layer is of the minimum thickness, it can, of course, be more easily permeated by liquids and gases. Moreover, it is often so carelessly applied that its protective properties are nil. If applied in frosty weather or with the least admixture of mud or grease, such as is so plentifully present in vessels while under construction, its adhesiveness is most seriously impaired. Whilst, therefore, the objections entertained by shipowners to the employment of such

immense quantities of cement concrete as was formerly common are perfectly justifiable; on the other hand, the reduction of the cement to an excessive extent and its careless application are as strongly to be deprecated.

Efforts directed towards meeting the conditions of weight-saving by means of protective substances of a lighter nature than Portland cement are, therefore, worthy of greater consideration. Bituminous or asphaltic substances answer this description, and their application to purposes of this kind preceded that of cement by many years. The discarding of these at an early period, and their very occasional employment ever since, although perhaps warranted by actual experience, was largely due to want of care in their manufacture, and to their imperfect application by inexperienced and sometimes irresponsible workmen. That bituminous cements, scientifically manufactured and properly applied, have certain qualities to recommend them, even apart from their lightness, has sufficiently been proved, and a thoughtful paper on the subject of common protectives for iron and steel vessels, read at this year's spring meeting of the Institution of Naval Architects, by Prof. P. B. Lewis, of the Royal Naval College, calls attention to these qualities. Referring to the porousness of Portland cement, especially in the case of a thin coating, and of the liability thus occasioned for its being permeated by liquids and gases, and rapidly wasting away, Prof. Lewis said:—"It is for this reason that I consider bituminous or asphaltic varnishes, freed from any trace of acid, and applied hot, or sound tough paint, preferable to cement, as although they are not so hard, yet if serious corrosion should be set up, it is easily discovered and stopped before much damage results; whilst being impervious to moisture, deleterious solutions, either from the coal bunkers or cargo, would be prevented from acting upon the skin of the ship." The tendency to blister and soften under the heat of tropical climates is the principal objection urged against the employment of bituminous cements as usually made and applied, yet the fact remains, as pointed out by Prof. Lewis, cements of the bituminous order, if scientifically manufactured and properly applied, will, in the long run, prove the most preferable.

Several firms are now engaged in the manufacture of cements of this kind, and an improved bituminous cement patented and manufactured by Mr. William Briggs, of Arbroath Chemical Works, which specially meets the requirements of the whole case, is presently receiving wide adoption in shipbuilding yards throughout the kingdom. This substance, which the manufacturer terms "Tenax," has been proved by independent skillful analysis and experiment, and by experience in actual service, to possess in a degree never before attained the qualities of adhesiveness, heat-resistance, and the dual quality of strength with lightness.

"Tenax" does not exceed one fourth the weight of Portland cement. The gain in carrying—and consequently in earning—capacity which this represents is by itself a powerful inducement for owners and builders to adopt it, but when to this is added the important consideration of more efficient protection, reduced cost of upkeep, and prolonged lifetime for the steamer, every reason surely exists for its acceptance by both builders and owners.

For the inside of bunkers, ballast tanks, and all vertical or horizontal plating subject to corrosive influences to resist which ordinary paints are of no use, Mr. Briggs is also supplying a bitumenoid compound which he designates "Ferroid," the efficiency of which, as a protective medium, is receiving daily confirmation. It is especially suited for coating the lower parts of engine-rooms, where the condensed steam and waste oils from the engines produce serious corrosion, and for the tank tops of vessels, which carry iron or copper ore, nitrate, salt, sugar, corrosive chemicals, &c., all of which have a most deleterious effect upon the metal work of vessels' holds. Ferroid is unaffected by dilute acids or a strong solution of caustic soda, either of which will remove any ordinary paint in ten minutes. It is applied at a temperature of 360° centigrade, adheres tenaciously to the smooth surface of metal, and forms a hard, tough, durable coating, effectually preventing corrosion, and absolutely proof against any ordinary atmospheric influences.

STEEL PLATES FOR THE "TEXAS."—For steel plates for the United States line-of-battle ship *Texas* there were but two bids opened recently at the Navy Department. The lowest was from the Linden Steel Company. The other bidder was Messrs. Carnegie, Phipps, & Co.

## SHIPBUILDING & MARINE ENGINEERING OF 1889.

### NORTH-EAST COAST DISTRICT.

THE prosperity which has generally attended the allied industries of shipbuilding and marine engineering has not omitted the North-East Coast, and the outputs of the leading rivers, the Tyne and the Wear, will be found to have been in excess of any previous year. At the time of writing, the entire returns for the United Kingdom are not to hand, but if the Clyde output has been relatively as great as that of the Tyne and Wear, it may in all probability be found that the year 1889 will have eclipsed that of 1888, when one million and a quarter tons of shipping were launched. The year 1888 showed an improvement of about 330,000 tons over its predecessor, and the increase of the output of 1889 over that of 1888 appears likely to be even greater. Such great increases cannot however continue, and it will be better for the continued welfare of all concerned if, in the year 1890, there is a falling off in the output, otherwise a great collapse will come not much later.

#### BLYTH.

Two years ago it was a matter of comparative congratulation that one steamer of 2,120 tons gross had been constructed, but in the year just closed the Blyth Shipbuilding Co., Limited, has launched eight steam vessels of 10,889 tons, three of which were constructed of iron, and the Union Co-operative Shipbuilding Co. two steamers, both of wood of 83 tons, a total for the port of 10 vessels, and 10,972 tons—or an increase of over 4,000 tons as compared with the output of the year 1888. In addition to the new vessels constructed by the Blyth Shipbuilding Co., Limited, over one hundred steamers have passed through this company's hands for repairs, and to further develop the repairing branch of their business the company is having a graving dock constructed, capable of accommodating vessels up to 350 ft. in length, which is expected to be completed early in the year. The future prospects of the Blyth Shipbuilding Co., Limited, appear to be good all round, both as regards old and new work, at present three steamers respectively of 4,000, 2,550, and 1,550 tons being on the stocks.

#### THE TYNE.

Allusion has already been made to the fact that the output of tonnage for 1889 exceeds that of any previous year; 153 vessels of 281,710 tons having been launched as compared with 132 vessels of 213,205 tons in the previous year, a substantial increase of 21 vessels and 68,505 tons. Even as compared with the great year 1883, the results were almost equally satisfactory, the output being then only 216,000 tons.

The general features of Tyne shipbuilding has been the construction of steam vessels and the more general adoption of steel as a material. Practically no sailing vessels have been constructed, as out of the four small craft, designated as such, three were large hoppers. Sixteen vessels have been constructed of iron, and half of the number were tug steamers—and only three were upwards of 1,000 tons gross register. Comparing the percentages of steel-built tonnage for the last four years launched on the River Tyne, our readers will see at a glance how largely the new material is now adopted, and how continuous has been its increased adoption.

Year.	Total Tonnage Built.	Steel Tonnage Built.	Percentage of Steel Tonnage to Total.
1885	102,998	56,095	54½
1886	83,247	59,729	71½
1887	105,206	98,190	93½
1888	213,205	201,721	94½
1889	281,710	276,601	98

Palmer's Shipbuilding & Iron Co., Limited, again have the honour of having the largest output of any firm or company on the River Tyne, and we will not be surprised if it be found to be the greatest output of any of the shipbuilders in the United Kingdom.

From the Jarrow and Howden yards there has been launched eight vessels, all steamers, built of steel, of 64,669 tons gross register. This is in excess of any previous year, the nearest approach being 61,113 tons in the year

1883. The great bulk of the vessels built by Palmer's Shipbuilding and Iron Co., Limited, have been during the past year mercantile steamers, many of great burthen, but a special craft was the Austrian torpedo catcher *Planet*, of 480 tons displacement in sea-going trim, with engine power of 3,500 I.H.P., expected to be capable of propelling the vessel at a mean speed of 20½ knots per hour.

In the immediate future the construction of war vessels will be a prominent feature in this company's operations, and possibly will entail a reduced output of tonnage for the year 1890, but as this will not cause a diminution of employment for workmen, and may assist to obviate a glut of mercantile tonnage, from these points of view, it is satisfactory to know that at the Howden yard three of the second-class cruisers will be constructed; and at the Jarrow yard two of the most powerful armour-clads for Her Majesty's Navy. Few, if any, establishments carry out more extensive overhauling and repairing work than is executed at the Jarrow Dry Dock and Slipway, which are both usually fully employed, a feature of Palmer's Shipbuilding and Iron Co. not to be overlooked.

Sir Wm. Armstrong, Mitchell & Co., Limited, stand second this year, as in 1888, but the combined output of the Elswick and Walker yards, amounting to 15 vessels of 34,415 tons, is not much of an increase upon the output of the previous year, when the vessels constructed were 24 in number, and 32,541 tons. During the year just closed four of the vessels launched were for the British Government, namely, H.M.S. *Pandora*, *Pelorus*, *Whiting*, and *Wizard*, and of the remainder seven were for foreign, and four for British owners, the average tonnage being over 2,000 tons each.

Messrs. C. S. Swan & Hunter, Wallsend, occupy the third position on this occasion, their output being 12 steel steamers of 28,312 tons, an increase of nearly 10,000 tons as compared with 1888, upon which the firm is to be congratulated. Every one of the vessels built by this firm exceeds 2,000 tons, and several are for special trades. The *Circassian Prince* is an oil-in-bulk steamer; the *Kriemhild*, a large passenger steamer for a German line from Hamburg to Japan and China; the *Maori*, a dead meat carrying vessel for the Shaw, Savill & Albion Line; and the *Attivita* for the Italian emigrant trade from Genoa to South America. The firm of Swan & Hunter have fair prospects of another good year's work, having at present five steamers on the stocks.

Messrs. John Redhead & Sons, South Shields, who were fourth on the list in 1888, occupy the same position this year. They have built twelve steamers of steel, of 26,182 tons, as compared with thirteen steamers of 23,045 tons in the previous year. The vessels were all cargo steamers, one of which, the *Charters Towers*, for Messrs. F. Stumore & Co., of London, is the largest vessel ever built at South Shields. This firm has sufficient work on hand to keep their establishment fully employed during the next six months.

Messrs. R. & W. Hawthorn, Leslie & Co., Limited, Forth Banks, Hebburn, and St. Peter's, although their output of eight steamers of 22,536 tons falls short of the previous year, have been and continue to be well employed. On a recent visit we saw seven steamers in various stages of progress in their Hebburn yard, including the third-class cruiser *Bellona*, the Russian volunteer steamer *Eagle*, both of which are twin-screw vessels with engines of great power, and have fine-lined hulls. The latter vessel's engines will indicate 9,000 H.P., the boilers are fitted with Purve's patent ribbed furnaces, and a speed of 18 knots is expected to be attained. The *Bellona* is designed for 20 knots, and the builders (R. & W. Hawthorn, Leslie & Co., Limited), have also constructed and completed the engines for the sister vessel *Barkham*, built in Her Majesty's Dockyard during the last year. Two of the remaining vessels were large steamers for the well-known shipowners Messrs. Lamport and Holt, of Liverpool, and altogether there is a certainty of a large output for 1890. Amongst other large orders executed by Messrs. R. & W. Hawthorn, Leslie & Co. during the year, and which do not appear in the lists of vessels, as the hulls were built at the Elswick yard, are the triple-expansion engines of H.M.S. *Pandora* and *Pelorus*, in which all the latest improvements have been adopted. The engines of these vessels will indicate 7,500 H.P., and it may be interesting to note that the engines of the *Pandora* were put on board in two lifts.

Statistical returns are sometimes misleading, and especially in such instances as the company under consideration, who, in addition to carrying on heavy repair work and alterations at their large dry dock, &c., carry out extensive operations in forgings, &c., for other firms. In the boiler-making department Lan-

cashire boilers for land purposes are constructed in large numbers, besides which the locomotive department is kept well employed.

Messrs. R. Stephenson & Co., Limited, Hebburn, stand sixth in order, with an output of seven steamers, all built of steel, of 20,517 tons gross register, three of which, the *Durham*, *Matatus*, and *Morella*, considerably exceed 3,000 tons. Seeing that this company, which has not been long in existence, has rather more than doubled its output as compared with 1888, the result must be considered eminently satisfactory. At present they have two steamers in course of construction.

Messrs. Wigham, Richardson & Co., Walker, closely dispute with the last-mentioned firm the order of position for the greater output, having launched in excess three vessels, viz.:—ten vessels, nine of which are screw steamers, all built of steel, but of only 20,353 tons—in addition to which they have supplied engines to the steamers *Port Caroline* and *Strathdee*. The most notable fact in connection with this firm is, however, that it is the only one on Tyneside that has as yet constructed a quadruple-expansion engine, and the only firm in the country or in the world that has constructed a quadruple-expansion engine having four cranks. As our present space is limited, we forbear considering in any detail this latest development in marine engineering, except to state that the engines of the s.s. *Fonar* are the patent of Mr. J. Tweedy, of the firm of Messrs. Wigham, Richardson & Co. On a future occasion we trust to have the opportunity of illustrating and fully describing these engines, for which great uniformity in turning the shaft and simplicity of design are amongst the advantages claimed. In almost every other instance, the vessels constructed on the river Tyne have been fitted with triple-expansion engines.

The Tyne Iron Shipbuilding Co., Limited, Willington Quay, have launched eight steamers, all built of mild steel, representing an aggregate of 15,547 tons, a substantial increase upon the output of the previous year when five vessels of 12,211 tons were launched. The largest vessel was the *Cape Colonna*, 2,707 tons gross register and fitted with engines of 1,650 I.H.P. Two of the steamers, *Vesta* and *Ceres*, were constructed for owners at Helsingford, but the others were all for British firms. The prospects of an equally good output for 1890 appear to be satisfactory, the company having at present three steamers in progress. The average tonnage of the vessels built by the Tyne Iron Shipbuilding Co., Limited, this year has been 1,943 tons register, and it is noteworthy that one of the vessels, the *Strathdee*, was built for Glasgow owners; surely this is something like carrying coals to Newcastle.

Messrs. Schlesinger, Davis & Co., Wallsend, have sent off the stocks during the past year nine vessels, all steamers, of 13,029 tons, one of which was constructed of iron. This is a considerable improvement upon the corresponding figures of the preceding year, viz.:—four steamers of 5,294 tons, and in this instance the prospects for the year now opening are far from dismal.

Messrs. W. Dobson & Co., Walker, although they have launched only eight steamers, have a good tonnage output of 12,501 tons, a notable increase as compared with 9,046 tons constructed in the year 1888. In each instance, the hulls were constructed of mild steel, two of the vessels being to foreign orders and the remainder for British owners. In all probability, the results of 1890 will be equally creditable, as at present the firm has four vessels on the stocks.

Messrs. Wood, Skinner & Co., Bill Quay, have again an increased output. Two years ago we had to report they had only launched three steamers of 2,660 tons in the year 1888, this state of matters has improved, four steamers of 5,326 tons being the output, and now for the year just closed they have launched seven steamers of 8,892 tons, an increase for the year of three steamers and 3,566 tons. Four of the vessels constructed during 1889 were for foreign owners, three being registered at Tonsberg and one at Christiania, all of which were in excess of 1,300 tons gross register, and of the type of steamer known as "handy-sized." Are not many shipowners overlooking the advantages of this class of vessel in their anxiety for having and doing big things?

Messrs. T & W. Smith, North Shields, come next on the list with seven vessels of 7,101 tons, and are to be congratulated upon their output as, so far as we can learn at the moment, it was nil in 1888, and in the year 1887 consisted of a solitary screw steamer of 226 tons. It is to be expected this old established firm will continue to have improved trade in the new work department as well as in their dry dockyard and general repairing and overhauling of existing vessels.

Edwards Shipbuilding Co., Limited, Howdon-on-Tyne, has been formed during the present year to take over the shipbuilding establishment of Messrs. H. S. Edwards & Son, and the company shows an increased output of six vessels (three of which are hopper barges) of 6,000 tons as compared with five vessels of 4,894 tons in the preceding year, one of the vessels, the *Tormore*, of 1,750 tons, being built for Glasgow owners.

Mr. Jos. T. Eltringham, Stone Quay, South Shields, has not experienced greatly increased activity, the number of vessels, eight, being the same as last year, although the tonnage, 945 tons, is somewhat in excess of the year 1888. At present there are two vessels under construction at his establishment, where the output is chiefly large steam tugs and similar craft.

Messrs. Hepple & Co., North Shields, have a somewhat similar comparative result to show as the last mentioned, their output being five iron steam tugs of 536 tons as compared with a tonnage of 431 tons in the year 1888.

The Tyne General Ferry Co. have constructed two steel paddle-steamers, *Doris* and *Isabel*, of 169 tons, for their own service during the year just closed, and the Northern Marine Engineering Co., South Shields, a steam launch.

The Wallsend Slipway and Engineering Co., Limited, although not actually engaged in shipbuilding, have been well employed in ship-repairing and alterations of an extensive character, besides executing a vast variety of engineering work, including a large number of their well-known and deservedly popular design of triple-expansion engines and boilers.

#### THE WEAR.

Although the output of this river does not come up to that of its neighbouring rival, it is eminently satisfactory, and also breaks the record. The total number of vessels launched during the year just closed was 102 of 217,383 tons, viz., 27 vessels and 74,875 tons in excess of the immediately preceding year. Only once previously has the annual output exceeded 200,000 tons, viz., in the well-known year of briskness, 1883, when 128 vessels of 212,313 tons of shipping were launched. It will be readily observable that the average size of vessels constructed has increased in recent years, seeing the tonnage is greater and the number of the vessels is fewer. A quarter of a century ago, about 400 tons was the average tonnage of Wear-built vessels, while in the year under our review, it was 2,131 tons. Not only does this speak volumes for the advance in the capability for work of the local establishments, but it also emphasizes the great improvements that have been effected in the not naturally commodious stream by the River Wear Commissioners.

Before leaving this question of increased size of vessels it may be worthy of note that whereas in the trio of years 1881-3, the average was between 1,600 and 1,700 tons; in the following years, it was much lower, in 1885 being only 1,342 tons. In 1887 and 1888 there was a marked upward change, the latter year the average being 1,898 tons, but at one step to reach 2,191 tons brings home forcibly the tendency of ship owners to favour larger deadweight carrying vessels. Is this not being overdone? No doubt working expenses of large steamers are relatively smaller, but is employment as certain as for relatively smaller vessels?

Messrs. J. L. Thompson & Sons, North Sands, for the fifth year in succession head the list of the Wear shipbuilders, having launched 13 steamers of 30,543 tons. This is, however, a decrease as compared with last year, when 35,121 tons of shipping were launched, but is in excess of even the "great" year of 1883. The diminished output has not been due to want of orders, but partly owing to the irregular working of the men, and the difficulty of obtaining delivery of material. Amongst the vessels launched during the year the steamer *Avonmore* is one of the most notable, having been constructed especially for the River Plate service of Messrs. William Johnston & Co., of Liverpool. The s.s. *Culgoa*, of 5,000 tons measurement capacity, also comes under the same category. This vessel will be engaged in the Australian wool trade, and forms the latest addition to the fleet of steamers owned by Mr. William Lund, of London, for whom the firm have previously built two vessels. With commendable precaution, this vessel from its maiden voyage is to have its bottom thoroughly protected from fouling, &c., by coatings of the original Rahtjen's composition, supplied by the Suter, Hartmann & Rahtjen's Composition Co., Limited. The whole of the vessels built by Messrs. Joseph L. Thompson & Sons during the last year were constructed of steel, and whilst the average tonnage in 1888 was only 2,200 tons, in the year now completed it had risen to

2,350 tons. At their Manor Quay Works this firm have (in addition to completing vessels launched from their North Sands yard) executed a considerable amount of repair work, upwards of 80 vessels, 60 of which have been dry-docked by the firm, having undergone alterations, overhauling, &c. During the year important additions of plant have been made to their Pallion Forge, enabling the firm to complete ship and engine forgings up to 20 tons weight.

Mr. James Laing, Deptford, again occupies the second position, but with a greatly increased output, 11 vessels of 29,160 tons having been launched from the Deptford yards during the last year, an increase of over 12,000 tons as compared with the previous year. All the vessels have been of considerable burthen, but the s.s. *Mombassa*, built for the British India Steam Navigation Co., is by far the largest and most important. This vessel, which is 4,662 tons gross register, was engaged by Mr. George Clark, Southwick Engine Works, whose establishment has been kept in full swing during the whole of the year.

Messrs. William Doxford & Sons, Pallion, who in 1888 occupied the fourth position, has attained to the third place on the year now closed, having launched 10 steamers of 24,150 tons, or an increase of more than 10,000 tons over the corresponding figures for the previous year. Amongst the vessels constructed by this firm, two have been specially designed and fitted for the New Zealand meat trade, viz., the s.s. *Mamari* and the s.s. *Maori King*, the latter of which was built to the order of Messrs. Ross & Co., London, and is fitted with all the latest improvements to carry about 18,000 carcasses. In view of future contingencies, the vessels' masts have been constructed to suit the Manchester canal bridges. It is also noteworthy that in the majority of vessels constructed by Messrs. William Doxford & Sons during the year they have adopted and fitted in the engine skylights, Mason's patent lights, which are more readily opened and closed than ordinary skylight flaps, have a neater appearance, and obviate the breaking of hinges, support rods, &c.

The Sunderland Shipbuilding Co., Limited, South Dock, have also a largely increased result to show for the year's working, the tonnage launched being more than double that of the previous year. Their output is 11 steamers of 23,565 tons, the majority of which have been built for the Hansa Steamship Co., of Bremen.

Messrs. Short Brothers, Pallion, who had the second largest output on the River Wear in the year 1888, has not retrograded, but has exceeded by 2,000 tons the figures of that year. During 1889 they have launched 10 steamers of 23,419 tons, but it should be mentioned that they have on the stocks a vessel of 2,600 tons ready to launch, which, if launched, would have placed them in a relatively improved position. The *Mittelweg* is the only steamer built by Messrs. Short Brothers during the year, of iron, and with the exception of the s.s. *Arabian Prince* and s.s. *Regina*, the engines of the steamers are of the triple-expansion type. The vessels excepted were fitted with quadruple-expansion engines by Messrs. William Allan & Co., Scotia Engine Works. Amongst the steamers constructed during the year by Messrs. Short Brothers is the *Florence*, built to the order of Colonel Gourley, the local member of Parliament, and, it may be noted, the *Moorish Prince*, as well as the *Arabian Prince*, has been constructed for Mr. James Knott's Prince Line, Newcastle-on-Tyne. In addition to constructing new vessels, Messrs. Short Brothers have also been largely engaged in extensive repairing and overhauling work.

Messrs. Robert Thompson & Sons, Southwick, have, like some other fortunate shipbuilders, more than doubled their output of the previous year, having launched eight steamers of 18,175 tons—a great increase on the output (8,666 tons) of the year 1888. The average tonnage of the vessels built this year by this firm is noteworthy, being 2,271 tons gross register, the largest vessel being the s.s. *Drummond*, of 2,864 tons. All the vessels, with the exception of the *Haslemere* (constructed of iron), were built of Siemens-Martin steel, but probably the most noteworthy is the s.s. *Wild Flower*, as this vessel was specially designed, constructed and fitted for carrying petroleum in bulk. In addition to the new work already referred to and elsewhere detailed, Messrs. Robert Thompson & Sons also carried out extensive repairing, overhauling and alterations to old vessels, including the restoration of the s.s. *Triumph*, which, as a wreck on the River Tyne for such a long period, baffled the efforts of the salvors.

Messrs. John Blumer & Co., North Dock, have launched one of the last-mentioned firm, but as their tonnage is up to a lower position for comparative outputs,

with nine steamers of 15,296 tons, which is 5,820 tons in excess of the firm's results for the year 1888. With the exception of the *Zeeena*, which was constructed of iron, the modern mated mild steel was adopted. Three of the vessels were built for foreign owners, viz.: the s.s. *Seggen*, of Bergen; the s.s. *Girgenti*, of Hamburg; and the s.s. *Daliki*, of Cephalonia. The quantity of tonnage that has been built on the River Wear for foreign owners is noteworthy, evidently British shipowners will some day experience even more bitterly than in the past "foreign competition," assisted as it is with an absence of load-line restrictions and the advantage of cheaper labour.

Messrs. Bartram, Haswell & Co., South Dock, have also to be congratulated upon a substantial increase of work performed during the year 1889, having launched five steamers, all constructed of steel of 11,917 tons. An increased tonnage of 4,737 tons, as compared with the output of the previous year, which was 7,180 tons. All the vessels were of large size, the *Edenmore*, *Lockmore*, and *Craigmore*, being built for the Johnston Line of Liverpool. As well as the majority of the firms on the river Wear, there is a prospect of continuous activity at the establishment of Messrs. Bartram, Haswell & Co., who have a wide reputation as successful shipbuilders.

Messrs. Osbourne, Graham & Co., North Hylton, although they have launched six steamers, fall next in order according to tonnage output, which is 10,692 tons. This is a specially successful result, as it is approaching threefold that of the previous year, which it exceeds by 6,692 tons. Two of the vessels, the *Argo* and *Regulus*, were built for foreign owners, and all of steel. The *Somerton* was fitted with quadruple-expansion engines by Messrs. William Allan & Co., Scotia Engine Works, and in the engine skylight Mason's patent combined frames and flaps were fitted. The near proximity of Messrs. Osbourne Graham & Co.'s yard to the recently started Wear Steel Works at Castle-town should prove advantageous for ensuring regularity of delivery of material, a desideratum much felt during the year that has terminated, by several local shipbuilders.

Messrs. W. Pickersgill & Sons, Southwick, have also succeeded in having an increased activity in their establishment, having launched five vessels of 7,960 tons, an increase of 1,104 tons for the year. Two out of three of the sailing vessels built during 1889 on the River Wear were constructed by Messrs. W. Pickersgill & Sons, viz., the *Inca*, built of iron, and the *Bluebell*, of steel. The largest steamer launched during the year by this firm was the *Sobraon*, of 2,385 tons. Recently a site adjoining Messrs. Pickersgill's yard has been acquired by them, and with this extension the facilities of the firm will be greatly increased.

The Strand Slipway Co. has launched four steel built screw steamers of 7,482 tons during 1889, an increased output of 2,158 tons, two of these vessels were of large dimensions, viz., the *Specialist*, 2853 tons register, and the *Athalie*, of Bergen, 2,158 tons. Considerable old work, on the slipway and elsewhere, was also executed by this company.

Messrs. S. P. Austin & Son, Pann's Shipbuilding yard, launched four vessels of 6,951 tons, and is one of the two firms on the river to show a decrease, but it is merely nominal, viz., 350 tons. All the vessels were constructed of steel, and with the exception of the barque *Vesta*, were screw steamers. The dry dock of the firm has been usually occupied during the entire year, and many important contracts of the repairing, overhauling, &c., description, have been executed in the docks and at the firm's extensive quayage.

Messrs. John Priestman & Co., Southwick, have built six steamers, constructed of steel, of 8,037 tons, as against 6,045 tons launched in the previous year.

Complete statistics of local marine engineering establishments have not yet reached us, but in every instance great activity has been the order of the day.

Mr. John Dickinson, of Palmer's Hill Engine Works, has completed twenty-two new sets of triple-expansion engines, besides tri-compounding the engines of the s.s. *Genua*. In addition to this extensive output of entire marine engines, repairing work has been practically uninterruptingly under way. Dickinson's patent crankshafts also continue to be in great demand, and to assist in providing work for Palmer's Hill Works upwards of 140 of these crankshafts having been constructed during the year.

Messrs. William Allan & Co., of the Scotia Engine Works, having only started operations about a year ago, have not had the same opportunity of other firms for securing a large output, but they have in addition to fitting four new sets of quadruple engines and one set of triple-expansion engines, also

converted into "quadruples" four old "compound" jobs, supplying new boilers, &c., besides reboiling the *Eagle*.

The North-Eastern Marine Engineering Co., Limited, at their Sunderland Works, engined sixteen steamers with triple-expansion engines, and at the Northumberland Engine Works, Wallsend, 26 steamers, making a total of 42 vessels engined during the year 1889, as compared with 39 vessels in the previous year.

#### WEST HARTLEPOOL.

At this port there has been likewise considerably increased activity, and this is all the more remarkable, as it was one of the first to recover from the "depression," and it would not have been a matter of surprise, if, in the last year, it had only continued to hold its own. In 1885 the output of tonnage was 33,030 tons; in 1886 a heavy falling off was experienced, only 15,293 tons being launched; but in 1887 these figures were more than trebled, 22 screw steamers of 53,632 tons having been constructed. Again in 1888 there was a phenomenal increase to 33 steamers of 73,083 tons, and now in 1889, 40 steamers of 84,109 tons have been launched—a substantial excess of 7 vessels and 12,026 tons over the preceding years.

Messrs. William Gray & Co., Limited, hold, as might be anticipated, the foremost position amongst the local firms, having launched 28 screw steamers of 58,731 tons, but although this is considerably in excess of the previous year's output of 22 vessels of 50,307 tons, still it has not sufficed to attain the position of the highest output in the United Kingdom, for, as already pointed out, these results are exceeded by Palmer's Shipbuilding & Iron Co., Limited. In each instance the hulls of the vessels built by William Gray & Co., Limited, have been constructed of steel, and fitted with triple-expansion engines. It is noteworthy that six of the vessels have been for German owners—a feature which is in marked contrast to last year, when only one vessel was built to foreign orders. Besides this splendid output of new work there has been a vast amount of overhauling, repairing, &c., carried out in the extensive dry docks of the company and elsewhere. As most of our readers will be aware, since the firm of William Gray & Co. was converted into a limited liability company, the Central Marine Engineering Works have become the property of the company, and at these works there has been turned out close on 30,000 I.H.P. of triple-expansion engines during 1889, as against 16,200 I.H.P. in the preceding year. In addition, boilers have been made for several steamers not requiring engines, and some large boilers for land purposes, altogether 60 boilers having been constructed during the year. The boiler-making department has advisedly been largely developed of late, in view of an increased demand, owing to vessels requiring to be reboiled. Another feature deserving notice is the New Forge, which now enables the company to manufacture all their ship and engine forgings. In another issue we may describe, and possibly illustrate this department. In the brass foundry and copper shop there has been great activity, for outside customers as well as for the company's own requirements. It may also be of interest to our readers to learn that during the year 1889 three sets of boilers have been fitted with Mr. Fothergill's patent closed ashpit forced draught.

Messrs. Edward Withy & Co., West Hartlepool, have also an increased output for the last year, having launched nine screw steamers, all constructed of steel, of 21,015 tons gross register, or 928 tons in excess of the corresponding figures for the year 1888. Four of the vessels were for local owners, one for the Mayor of Sunderland, Councillor Shadforth, and the remainder for London. The bulk of the vessels, indeed, all except one, were over 2,000 tons gross register and in each instance triple-expansion engines were fitted. So common is the adoption of mild steel in shipbuilding and the triple-expansion type in marine engineering, that it may now be taken for granted that without a contrary statement these features are present in every vessel recently constructed.

Messrs. R. Irvine & Co., West Hartlepool, has had relatively an experience of greatly increased activity, having launched four steel steamers of 6,129 tons as against an output on the preceding year of 3,455 tons.

#### THE TEES.

There has been an abnormal increase in shipbuilding operations on this river. In the year 1888 the output was only equal to 57,170 tons gross register, but in the year just closed this result has been nearly doubled, the aggregate tonnage launched in 1889 being 110,429 tons, a very good result for six shipbuilding firms.

Messrs. Ropner & Son, Stockton, who succeeded to M. Pears & Co.'s shipbuilding yard about two years ago, have the greatest increase of Teeside shipbuilders, having launched twelve steel steamers of 29,441 tons, an increased output of no less than 23,535 tons over the corresponding figures for the year 1888. The average tonnage of the vessels built by this firm was 2,453 tons, the largest being 3,650 tons, viz.:—the *Ataka*, of Liverpool, and the smallest 1,730 tons. No less than eight of the vessels built by Messrs. Ropner & Son were registered as owned in West Hartlepool.

Messrs. Richardson, Duck & Co., South Stockton, launched during the last year ten vessels of 21,535 tons, which shows an increased tonnage output of 2,916 tons. Four of the vessels—two large sailing vessels over 2,400 tons register—and two screw steamers both over 2,000 tons gross register, were constructed of ordinary iron, and seeing that the classification requirements have been from time to time so modified, to the detriment of steel, taking into consideration the greater liability of the latter to corrosion, we are not surprised that still some owners of even large vessels prefer the old-fashioned material.

Messrs. Craig, Taylor, & Co., Stockton, show a larger increase than the last mentioned firm. Their output for 1889 consists of five steamers of 10,450 tons gross register, or 3,931 tons in excess of the corresponding figures for the previous year, viz., 6,519 tons. In this instance it is very notable that all the vessels were constructed of iron. Whether this be partially or entirely due to the advice of the shipbuilder, or to the predilection of the owners, we are not in a position to say, but we do know that, despite the great advantages to a shipbuilder of having steel plates of almost any size, and thus reducing the butt and seam rivetting, and necessarily the cost of labour, there are good practical men who still think mild steel should be tabooed. As evidence, however, of the enterprise of Messrs. Craig, Taylor & Co., on the other hand, it must be pointed out that two of the vessels launched by them during the year, viz., the *Tancarville* and the *Petrolea*, were constructed for carrying oil in bulk. It is barely necessary to state that all the steamers built by this firm were fitted with triple-expansion engines.

Messrs. Raylton, Dixon & Co., Middlesbrough, had the largest output on the River Tees, launching during the year 18 steamers of 40,689 tons, two of which, each 2,168 tons gross register, were constructed of iron. This result shows that there has been much greater activity in the shipbuilding yards of the firm, as in the year 1888 the tonnage output was only 27,295 tons.

Messrs. R. Cragg & Sons, Middlesbrough, also show an increase, having launched five steamers, two built of iron, and remainder of steel, of 5,561 tons aggregate gross register, an increase for the year of 1,742 tons.

Messrs. W. Harkess & Son, Middlesbrough, have likewise a fair result to show, viz., two steel steamers of 1,700 tons for British owners, and one iron steamer of 1,000 tons for Hamburg, a total of three vessels of 2,700 aggregate gross register tonnage.

#### WHITBY.

Shipbuilding at Whitby during 1889 has not increased. Messrs. Turnbull & Son, who are the principal builders, have launched seven vessels, the aggregate gross tonnage of which amounts to 13,146 tons. This shows a slight diminution in tonnage, but an increase of one in the number of steamships turned out by them, as compared with their operations in 1888, when they built six vessels of 13,267 tons. During the present year the Whitby and Robin Hood's Bay Shipbuilding Co., which in 1888 built a wooden sailing vessel of 94 tons, have not been employed in the building of new vessels.

#### THE HUMBER.

The extent and character of the tonnage launched on the Humber is highly creditable to the firms engaged in the industry, for their river labours under disadvantages unknown to the River Clyde and the district extending from Blyth to the Tees. It has coal at a considerable distance, and its supplies of iron have also to bear the cost of considerable carriage.

The output for 1889 is practically threefold that of the previous year, 41 vessels of 21,712 tons having been launched in the year just closed as compared with 30 vessels of 7,734 tons, both these sets of figures including the port of Grimsby.

Earls' Shipbuilding and Engineering Co., Limited, Hull, have built the bulk of the tonnage, having launched 19 vessels, all steamers, of 18,455 tons, 11 of which are built of iron and the remainder of steel—the tonnage built of iron being 8,224 tons, and of steel 10,231 tons. Seven of the vessels were

small steamers built for Grimsby owners, and three were for Spanish ports.

Messrs. Cook, Welton, and Gemmell, Hull, have launched 12 steamers all built of iron, of 1,723 tons, principally for local owners.

Messrs. Smith & Stephenson, of Grimsby, have built three wooden sailing vessels for fishing purposes of 184 tons aggregate, and Messrs. Cochrane, Cooper & Schofield, Beverley, nine steam vessels of 1,350 tons, all constructed of iron.

A summary of the entire returns already reviewed, as to gross output of the district and materials of which it has been constructed, will be found in the following table:—

Ports.	Tonnage, Built of Steel.	Tonnage, Built of Iron.	Tonnage, Built of Wood.	Total Tonnage.
Tyre .. ..	276,601	5,109	—	281,710
Wear .. ..	211,069	6,266	—	217,335
West Hartlepool	84,109	—	—	84,109
Tees .. ..	82,634	27,795	—	110,429
Humber .. ..	10,231	11,297	184	21,712
Whitby .. ..	13,267	—	94	13,361
Blyth .. ..	7,963	2,926	83	10,972
	685,874	53,393	361	739,628
Corresponding Totals for 1888	480,333	34,214		514,547
Differences ...	205,541	19,179		225,071

In closing this necessarily brief and restricted review, attention is directed to the great increase in the total output of the district, and if it be found, as is probable, other districts have only an equal proportionate increase, the total output of new tonnage in the United Kingdom will be not less than 1,350,000 or 100,000 tons in excess of the year of "feast," 1883. Another minor remark may be made, viz., that although the great bulk of tonnage is now built of steel, still its use only increased by 42·7 per cent. over the steel-built tonnage of 1883—whereas in the case of iron, the increase was about 56 per cent. Will there be a reaction in both respects, will the total output of 1890 be less than that of 1889, and will iron in the not far distant future again bulk largely as a shipbuilding material? We are inclined to think the mercantile tonnage built in 1890 will be less, but who can foretell the future.

### FORCED DRAUGHT AS FITTED ON BOARD THE S.S. SANTON.

IN these days of experiments in applying forced draught to the combustion chambers of high-pressure marine boilers, it may be interesting to our readers to know something of the performance of the s.s. *Santon* on her recent voyage from the Tyne to Melbourne.

The *Santon* is one of the fleet owned by Messrs. Huddart, Parker & Co., of Melbourne, and was built by Messrs. C. S. Swan & Hunter, of Wallsend, Newcastle-on-Tyne. Her length is 315 ft.; beam, 39 ft.; moulded depth, 23 ft. 3 in., and her gross tonnage is 2,504. Her machinery and boilers were fitted by the Wallsend Slipway and Engineering Co., who, we understand, also fitted the *Burrunbeet* and the *Elingamite* for the same owners.

The *Santon's* engines are triple-compound, the cylinders being 22½ in., 36½ in., and 60 in., with 39 in. stroke, while the boilers can carry steam at 160 lbs. pressure.

The enterprise of her owners led them, as an experiment, to adopt forced draught for the *Santon*, and the necessary appliances were fitted by the Wallsend Slipway and Engineering Co., the result being that when the fans were driven at a moderate speed the combustion of fuel was perfect, and the men in the stokehole and engine-room were relieved from that oppression in working which is so commonly felt, especially in hot climates and with inferior coal. She is one of the few cargo vessels afloat utilizing forced draught. The engine-room is scientifically ventilated, and in the Tropics, when the temperature on deck was unendurable, the stokehole was comparatively cool.

Her speed with 2,000 tons on-board was 11½ knots, and on the voyage we refer to, that from the Tyne, via Gefle, in Sweden, to Melbourne, where she arrived on the 4th of October last, her time was only 61 days. She only took in 1,300 tons of coal at starting, and had to proceed from the Tyne to Gefle, and from Gefle to Melbourne without coaling. The voyage is one of upwards of 14,000 miles, and throughout all that length of straight-out steady steaming, the engines were never once stopped from any cause, and the boiler pressure was never below 154 lbs. This is a feat of steaming which we believe has never been excelled. The engineer reports that the forced draughts gave every satisfaction. He kept the fan running from 230 to 250 revolutions per minute, giving a pressure in the ashpits varying from 0·2" to 0·5" according to the condition of the fires, the pressure above the bars being 0·1", these various pressures having been found to give the best results with the coal burned. The tubes were never swept during the whole voyage, and the vessel steamed as easy the last day as the first. The temperature of the stoke-hole seldom reached 100° Fahrenheit, so that the stokers could always work without being oppressed, and the steam pressure never varied one pound, whilst not a single bar was burnt down during the whole voyage and the furnace fronts and baffle plates were in perfect condition.

In consequence of the success of the *Santon*, Messrs. Huddart, Parker & Co. have ordered the machinery and fittings for a similar installation of forced draughts to be sent out to Melbourne for their s.s. *Elingamite*.

### NEW FORGE AT WEST HARTLEPOOL.

THE great industrial concern at West Hartlepool, with which the name of Mr. Wm. Gray is associated, has grown apace within the past few years. The first important development of Mr. Gray's original business took place when the erection of the Central Marine Engine Works was decided upon some half-dozen years ago, and no finer monument to his enterprise and indomitable energy need be looked for than that unique establishment as it now stands. It may, indeed, without exaggeration be described as one of the very finest engineering establishments in the country, and nothing that sound practical judgment, backed by a free command of capital, could provide, has been omitted to secure in the very fullest degree the capabilities of economical production. With most men, the control of a shipbuilding yard capable of turning out 30,000 tons of shipping per year, having graving docks attached that are amongst the most constantly used in the kingdom, together with an extensive engineering establishment whose productive capacity may be roughly estimated at 25 sets of engines per year, would have been regarded as involving a sufficient amount of responsibility; but Mr. Gray appears to be one of those men whose mission is to "push on" and develop, and accordingly we find him establishing a supplementary shipyard, out of which was launched in 1889—the first full year of its working—not less than 20,000 tons of shipping. The latest outcome of Mr. Gray's untiring energy is a new forge, the construction of which was commenced and completed in the past twelve months. This building, which is 500 ft. long, by 85 ft. wide is, like all the other erections of which Mr. Gray has been the originator, designed in every detail for the realisation of one great object, namely, the minimising of labour expenditure in the execution of work. The furnaces are built on the most improved principle, and the fuel is conveyed to them by means of a hydraulic lift and a gantry, without the intervention of the old-time wheelbarrow man. The steam hammers are ten in number, and are of various sizes according to the work required of them, the most powerful being capable of striking with a force equal to about 250 tons. A hammer of special design, which is to be exclusively used in the manufacture of stern frames, has been provided, and it is one of the most effective tools for the particular purpose indicated that can be met with anywhere. In connection with the heavier hammers, there are hydraulic cranes, placed so as to convey the heated masses of metal from the furnace, with the least possible delay and trouble. After having traversed that part of the building which is occupied by the furnaces, hammers, and their accessories, the visitor is conducted through another portion, which for convenience of working is divided into two parallel sections. In one of these sections are placed 20 smiths' fires, with small hammers and other plant suitable for such a department, and in the other section are to be found

the lathes, planing and slotting machines, drilling machines, &c., required for "machining" the forgings, or in other words, putting the finishing touches to them, before being sent out for delivery. The advantages of being able to complete all the processes required in connection with the manufacture of ship and engine forgings under one roof will be readily appreciated by practical men, and even the uninitiated will not find it difficult to understand that this circumstance must conduce largely to the economization of time and labour. Indeed, we are assured, that a built crank shaft suitable for an ordinary cargo-boat can be forged, machined, and turned out from here within three or four days from the time of ordering, and this we believe is an achievement which is rarely accomplished. Before concluding this brief notice of the building, a word must be said regarding the roof, which is a most elegant structure, combining lightness with strength in a rare degree. It was originally constructed by the John Cockeril Co., Belgium, for the main transept of the Antwerp Exhibition building, and subsequently formed part of the Liverpool Exhibition building, whence it was transferred to its present permanent resting-place. Since the commencement of operations in the building some few months ago, a large number of heavy forgings have been turned out, among which may be mentioned the stern-frames, rudders, &c., for two steamers that are being built in a foreign yard. It may be added that a number of other foreign orders, besides several important home contracts, are now in hand. The forge has been started at a most opportune time, and under the enlightened management which has contributed so much to the efficiency of the engineering department of Messrs. Gray & Co.'s extensive works, it is safe to predict for the new undertaking a highly prosperous future.

## SHIPBUILDING AND ENGINEERING DURING 1889.

### THE CLYDE AND SCOTLAND.

A REVIEW of the past year's work in the shipyards, engine-shops and subsidiary branches of this great Clyde industry affords ample grounds for satisfaction, and this feeling is intensified by a recognition of the existing state of matters, and of the long period of prosperity in prospect. Although on the whole the year has been remarkably free from serious general strikes, there has been plenty of occasion for complaint on the part of individual firms, and sometimes of a district of firms, at the serious loss of time and wages demands by the workmen. Contracts have been delayed beyond the stipulated time, and, even where penalties were not exacted for this, shipbuilders have had to bear the brunt of owners' displeasure and threats, in addition to which their capital as represented in plant has not been fully employed, and their profits have consequently been diminished. Although the prices secured by shipbuilders and engineers during the year were usually in advance of those paid the year previous, this is counteracted to a very large extent by the enormous rise in the prices of raw and manufactured material which has taken place all round. Thirty per cent. of rise on the raw material alone has taken place over the period of six months. Steel and iron have been advanced from the bottom price paid last year as much as £2 10s. per ton, while the rise in malleable iron has been much greater.

What with most assurance can be said of the great activity which has characterized the year, is, that the workmen have benefited substantially. Almost every class of artisan has had his wages advanced, in some cases without difficulty, in others as the result of "disputes"; and from this point of view at least, the year has been most prosperous. Only one strike of any great consequence occurred—that of the engineers of the upper districts of the Clyde—but happily that was arranged on an equitable basis before it lasted long. The recently formed federation of employers of all the districts in the kingdom will do much in future to avoid disastrous or ill-advised disputes, because the amicable settlement of all disputes with their workmen is a prominent article in the federation's code of faith, and there is quite an evident and growing desire on the part of workmen to meet the employers in the same spirit. Proceeding now to speak more in detail of the past year's work and work presently in hand throughout the several shipbuilding districts in Scotland, the first to be referred to naturally is:—

THE CLYDE.—In the forty odd shipyards comprised in this great industrial centre, there have been 250 vessels aggregating

335,200 tons produced; of this total 253,374 tons were of steam vessels, and 80,946 tons, or a little less than one-third, were of sailing vessels, while the remnant, 881 tons, was made up of "trifles" in the way of odd miscellaneous craft which might almost remain "unconsidered." Compared with the previous year's output, this result shows a substantial increase. During 1888 the total output was represented by 224 vessels of 280,037 tons, the increase thus being 25 vessels, and 55,164 tons. The past year's output is distinctly the largest since 1883, but is 85,000 tons less than that year of marvellous plenty. For purposes of comparison, however, the following table of the annual output over a period will afford in a concise way all that is needed.

Year.	Tons.	Year.	Tons.	Year.	Tons.
1889 ..	335,201	1879 ..	174,750	1869 ..	192,310
1888 ..	280,037	1878 ..	222,353	1868 ..	169,571
1887 ..	185,362	1877 ..	169,710	1867 ..	108,024
1886 ..	172,440	1876 ..	174,824	1866 ..	124,513
1885 ..	193,453	1875 ..	211,824	1865 ..	153,932
1884 ..	296,854	1874 ..	262,430	1864 ..	178,505
1883 ..	419,664	1873 ..	232,926	1863 ..	123,262
1882 ..	391,934	1872 ..	230,347	1862 ..	69,967
1881 ..	341,022	1871 ..	196,229	1861 ..	66,801
1880 ..	241,114	1870 ..	180,401	1860 ..	47,833
				1859 ..	35,799

The returns as might have been expected bear out the fact of iron having now been all but entirely superseded by mild steel as the structural material. For the main features in a ship construction, such as frames, floors, beams, and shell-plating, steel is almost universally adopted, but for such parts as deck-plating, bunker and tunnel plating, and the tops of water ballast bottoms—which features are subject to corrosive and other wearing influences, and are structurally not of the first importance,—iron is by preference still used. The tendency is to further extend this practice, as experience in actual service demonstrates that steel succumbs much more rapidly to corrosive influences than iron. The extent to which steel has superseded iron as the structural material must, therefore, be discounted so far, and there is still a small foothold for the manufacture of the old material. Out of the 250 vessels built on the Clyde during 1889, as many as 210 representing 326,136 tons, were of steel, leaving only 40 vessels of about 9,065 tons constructed of iron and wood. Of iron vessels there were 19 of 8,087 tons, and 21 of 978 tons of wood. The following table shows how steady has been the progress in the adoption of steel for shipbuilding purposes.

	Total Tonnage.	Tonnage of Steel Vessels.	Percentage of Steel to Total Tonnage.
1879	174,750	18,000	About 10½
1880	241,114	42,000	" 17½
1881	341,022	66,600	" 19½
1882	391,934	108,254	" 27½
1883	419,664	129,651	" 31
1884	296,854	133,670	" 45
1885	193,453	92,677	" 48
1886	172,440	116,932	" 68½
1887	185,362	148,596	" 80
1888	280,037	269,480	" 96
1889	335,201	326,136	" 97½

The work of the past year has been fairly spread over the whole district of the Clyde and its estuary, and we give below a tabulated statement which exhibits clearly the extent to which the several firms have contributed to the grand total. The horse-power of engines, in the table, it should be explained, is only given where the builders were also the engineers. A separate statement of the engines made by engineers who are not themselves builders, will be afterwards given.

Name of Firm.	No. of Vess.	Tons Strs.	Tons Ships.	Total Tons.	I.H.P.
Russell & Co. ....	21	16,653	29,847	46,500	
W. Denny & Bros. ....	20	25,230	—	25,230	22,730
Fairfield Co. ....	8	23,830	—	23,830	29,750
Scott & Co. (Greenock) ....	12	20,084	536	20,630	23,200
Alex. Stephen & Son ....	8	14,688	3,745	18,430	9,000
Caird & Co. (Greenock) ..	7	16,461	—	16,461	15,500

Name of Firm.	No. of Vcs.	Tons Stra.	Tons Ships.	Total Tons.	L.H.P.
Charles Connell & Co. ....	8	8,252	6,768	15,020	—
Barclay, Curle & Co. ....	6	323	12,437	12,760	1,000
John Reid & Co. ....	7	7,045	5,709	12,754	—
Jas. & Geo. Thompson ....	3	12,316	—	12,316	20,000
D. & W. Henderson ....	17	11,362	444	11,806	8,250
R. Napier & Sons ....	3	11,640	—	11,640	16,500
R. Duncan & Co. ....	7	4,472	6,785	11,257	—
A. M'Millan & Son ....	7	4,939	5,505	10,444	—
London & Glasgow Company	3	8,666	—	8,666	6,700
A. & J. Inglis ....	3	8,294	10	8,304	6,700
Aitken & Mansel ....	3	8,140	—	8,140	—
Lobnitz & Co. ....	8	6,507	—	6,507	5,450
David J. Dunlop & Co. ....	5	4,900	800	5,700	3,600
Wm. Hamilton & Co. ....	3	1,800	3,512	5,312	—
Murdoch & Murray ....	3	5,269	—	5,269	—
Napier, Shanks & Bell ....	4	3,051	2,115	5,166	—
M'Knight & Co. ....	5	4,558	—	4,558	—
Campbeltown Company ..	3	4,484	—	4,484	—
Ailsa Company ....	7	3,771	—	3,771	—
Fleming & Ferguson ....	5	3,620	—	3,620	3,600
Simons & Co. ....	10	3,150	225	3,375	3,100
Mackie & Thomson ....	5	2,215	—	2,215	—
Birrell, Stenhouse & Co. ..	1	—	2,160	2,160	—
Scott & Co., Bowling ....	5	2,054	—	2,054	—
Alley & M'Lellan ....	—	1,517	—	1,517	7,420
John Fullarton & Co. ....	4	965	—	965	—
Blackwood & Gordon ....	2	800	—	800	500
M'Arthur & Co. ....	5	752	—	752	—
Mechan & Son ....	—	675	—	675	—
T. B. Seath & Co. ....	7	167	810	527	400
David M'Gill & Co. ....	3	326	—	326	—
Marshall & Co. ....	2	140	—	140	—
W. Fyfe & Son ....	12	—	91	91	—
J. & J. Hay ....	1	90	—	90	—
Hanna, Donald & Wilson..	1	86	—	86	1,000
D. M. Cumming ....	3	34	—	34	56
Ardrossan Co. ....	2	38	—	38	—
Several yacht and boat-builders.....	—	—	—	881	—
Total.....	250	253,374	80,946	335,201	199,256

Almost without exception the output of the separate firms during the past year is greatly in advance of that of the previous years, and we have to go back to the busy times of 1881-83 to find a parallel. Messrs. Russell & Co., of Port-Glasgow and Greenock, it will be seen, are at the top of the list, with an output of 21 vessels, aggregating 46,500 tons. This enterprising firm carry on three separate yards, and contrive to re-fill the berths vacated in so surprisingly prompt a fashion as to earn for themselves a sort of "uncanny" reputation amongst their more slow-going competitors on the Clyde. This is the fifth time they have occupied this distinguished position in the annual shipbuilding stocktaking. The past year's figure is only 1,055 tons over their production of last year, but is 19,465 tons over that of 1887. The work comprised 14 sailing ships, of 29,847 tons, and seven steamers of 16,653 tons: and the total is the largest ever attained by any single Clyde shipbuilding firm. Of course the fact will not be overlooked, that by far the larger half of their output consisted of sailing ships, and the remainder of plain cargo-carrying steamers, and that in view of the comparative absence of elaborate internal fittings, the tonnage does not represent the same amount of labour as in the case of high-class fully-equipped passenger-carrying vessels. Messrs. William Denny & Bros., Dumbarton, come second on the list, a position they also held last year. Their total is 20 vessels of 25,230 tons, with engines of 22,730 I.H.P. Last year, when the production was the greatest in the history of the firm, the total was 38 vessels, of 30,143 tons, with engines of 36,980 I.H.P. This year's figure is a fair average for the past six or seven years. The Fairfield Co., who are third in point of tonnage, have completed eight steel steamers of 23,830 tons and the engines of those make up 29,750 H.P. Messrs. Scott & Co., Greenock, constructed 12 vessels, of 20,630 tons, including 11 steamers, of 20,094 tons, with engines of 23,200 I.H.P., and a schooner of 536 tons. This is the largest year's production in the history of the firm, exceeding by about 2,000 tons the total in 1883. It is three times the production of 1888, and ten times that of 1887.

Limited space, however, forbids us instituting similar comparisons for all the firms contributing to the annual aggregate, and we pass on to consider the size and character of the vessels produced. Considered from the point of view of size and capacity, the past year's work compared with the three previous years, yields the following. Of the vessels launched there were:—

	1889	1888	1887	1886
Under 50 tons .. ..	49	27	67	28
" 100 " .. ..	27	18	18	13
" 500 " .. ..	48	58	46	46
" 1,000 " .. ..	20	34	10	14
" 1,500 " .. ..	13	17	16	11
" 2,000 " .. ..	27	22	16	24
" 2,500 " .. ..	25	17	11	20
" 3,000 " .. ..	16	17	10	2
" 4,000 " .. ..	24	12	6	2
Above 4,000 " .. ..	10	9	6	6

The largest, and in other respects the most noteworthy of the individual vessels produced, were the Red Star liner *Friesland*, over 7,000 tons, launched from Messrs. Thomson's yard; the steamer *Thames*, of 5,600 tons, and *Magdalena*, of 5,300 tons, both built by R. Napier & Son, Govan, for the Royal Mail Steam Packet Co., Southampton; the Pacific Co.'s Mail steamer, *China*, of 4,940 tons, which, with a speed of 18-52 knots, recently broke the transpacific record; the *Calais-Doune*, a cross channel passenger steamer of 18-78 knots speed; the *Monte-Video*, 5,096 tons, built by Messrs. Deny & Bros., Dumbarton, for the Compania Transatlantica of Barcelona; three vessels for the North German Lloyd Co., Stuttgart, 5,356 tons, *Karlsruhe*, 5,347 tons, and *Munchen* of 4,805 tons, built by the Fairfield Co., and a British India steamer of over 5,000 tons, constructed by Messrs. A. J. Inglis. Several large sailing ships of over 3,000 tons have been constructed during the year, but still larger vessels are being constructed, Messrs. D. & W. Henderson & Co., Partick, having in hand a five-masted vessel to carry over 5,000 tons.

Referring to the tonnage output to the various nationalities, of the owners it is of interest to note that one-third of the total was ordered by foreign firms. In all, 80 vessels of 115,272 tons, against 62,993 last year, were ordered by foreign firms. Germany took 14 vessels, 42,428 tons, as compared with 11,825 tons last year, and other nationalities in the proportion given in the appended table. Scotch owners are credited with another third, 67 vessels of 104,977 tons, leaving the remaining third as the portion of the English centres:—

	1889	1888
No. of Vessels.	Tons.	Tons.
FOREIGN—		
Germany .. ..	14	42,428
Portugal .. ..	6	16,018
Australia .. ..	7	11,316
Spain .. ..	5	59,195
Belgium .. ..	1	7,116
France .. ..	2	6,314
South America .. ..	14	5,187
Japan .. ..	2	3,948
China .. ..	2	2,878
Canada .. ..	4	2,666
United States .. ..	1	2,361
South Africa .. ..	1	500
India and other countries ..	14	11,595
Total .. ..	73	115,272
HOME—		
Scotland .. ..	67	104,977
London .. ..	20	44,599
Liverpool .. ..	19	43,975
British Government .. ..	4	6,810
Other ports .. ..	59	19,878
Total .. ..	136	200,269

Regarding the machinery made by firms who confine themselves to engineering alone, and not taking account of in the table previously given, such work amounted to 148 sets of engines of 87,376 I.H.P. In addition, 10 steamers were refitted with triple-compound engines in room of the ordinary compound type, the H.P. represented being 15,275. This makes a total of 102,650 I.H.P. of machinery produced by the engineering firms who are not themselves shipbuilders. Adding to this the 199,250 H.P. contributed by firms who also built the

hulls, gives a grand total of 301,900 I.H.P. as the production of marine engines on the Clyde during the year. In 1888 the corresponding figures were 258,465 I.H.P., and in 1877 they were 199,000. Of the total, 24 sets of machinery of 20,880 I.H.P. were made for and fitted on board vessels built away from the Clyde. The following is a tabular statement for the past year and the year previous, of the marine engines made by firms who did not themselves build the vessels in which they were fitted:—

Name of Firm.	1889		1888		1887	
	No. of Eng.	I.H.P.	No. of Eng.	I.H.P.	No. of Eng.	I.H.P.
Messrs.						
J. & J. Thomson .....	7	17,350	7	14,100	6	10,200
Dunsmuir & Jackson .....	14	16,431	11	11,730	9	3,950
Hutson & Corbett .....	14	12,350	14	10,800	5	3,600
Jas. Howden & Co. ....	18	9,900	6	7,600	4	6,850
Muir & Houston .....	16	9,150	12	6,725	3	4,450
D. Rowan & Sons .....	8	7,750	8	6,170	5	7,460
Bow & M'Lachlan .....	14	7,145	18	2,790	—	—
Rankin & Blackmore .....	5	6,400	4	3,840	4	5,640
Ross & Duncan .....	24	4,575	26	5,245	26	4,875
Kincaid & Co. ....	5	4,230	2	4,000	3	800
Wm. Kemp .....	4	2,680	4	2,530	2	800
A. & J. Inglis .....	*1	1,800	*1	1,800	—	—
Hanna, Donald & Wilson ..	*3	900	—	—	—	—
Robert Harvey & Co. ....	1	900	—	—	—	—
Duncan Stewart & Co. ....	1	850	3	4,000	2	2,450
Wm. King & Co. ....	3	240	4	4,040	1	700

\* In addition to engines built for vessels launched this year by the firm.

Total in 1889 ..... 148 engines of 102,651 I.H.P.

„ 1888 ..... 184 „ 98,305

„ 1887 ..... 77 „ 53,470

As regards work in hand in the various yards on the river and estuary, and in different stages of construction, there are 166 vessels aggregating 300,629 tons, which in itself represents a good average year's work. This, however, does not cover the orders most recently booked, or announced as having been received, and may safely be considered as the minimum figure. The following table, which has been compiled from statements authorised by the various firms themselves, shows at a glance the amount of work in hand or definitely booked by the firms throughout the several localities of the river. For purposes of comparison the corresponding figures are given for 1888 and 1887. Details of the work have been given in our Industrial Notes section in the past few issues.

	1889		1888		1887	
	No. of Gross Ves.	Tons.	No. of Gross Ves.	Tons.	No. of Gross Ves.	Tons.
<b>GOVAN—</b>						
Messrs. R. Napier & Sons ..	3	20,000	2	7,000	2	6,600
London & Glasgow Co. ..	5	14,500	1	3,500	4	9,875
Fairfield Co. ..	9	40,300	4	12,150	6	10,700
Alex. Stephen & Son ..	6	16,900	8	16,440	5	13,100
Mackie & Thomson ..	5	6,830	6	6,180	—	—
<b>PARTICK—</b>						
A. & J. Inglis ..	6	11,280	3	12,000	3	13,000
D. & W. Henderson & Co.	4	13,000	5	12,000	5	11,000
<b>WHITBURN—</b>						
Barclay, Curle & Co. ..	6	18,000	6	12,420	3	9,600
Aiken & Mansel ..	—	—	3	7,000	3	6,000
Charles Connell & Co. ..	3	7,000	4	12,000	3	7,000
<b>CLYDEBANK—</b>						
Napier, Shanks & Bell ..	4	5,730	4	7,000	1	1,700
Jas. & Geo. Thomson ..	9	32,100	6	14,400	2	18,000
<b>RENFREW—</b>						
Lobnitz & Co. ..	—	—	4	6,900	13	4,180
Simons & Co. ..	6	4,200	3	1,400	4	1,370
<b>PAISLEY—</b>						
James M'Arthur & Co. ..	1	380	4	720	2	805
Fleming & Ferguson ..	4	3,390	3	1,915	1	1,000
John Fullerton & Co. ..	4	1,200	—	—	2	810
Hanna, Donald & Wilson	1	700	—	—	2	1,800
<b>BOWLING—</b>						
Scott & Co. ....	5	1,745	3	1,300	1	470

#### DUMBARTON—

W. Denny & Bros. ..	9	24,000	6	8,150
A. McMillan & Son ..	2	3,600	5	2,700
Birrell, Stenhouse & Co. ..	—	—	1	1,800
Murray Brothers ..	5	1,100	—	—

#### GREENOCK AND PORT-

#### GLASGOW—

Caird & Co. .. ..	5	16,200	9	23,400	2	12,000
Russell & Co. .. ..	12	22,800	15	25,000	15	35,000
Scott & Co. ....	4	7,300	8	19,700	3	7,000
D. J. Dunlop & Co. ..	4	2,000	2	4,400	—	—
John Reid & Co. ..	3	700	—	12,000	3	5,400
Murdoch & Murray ..	3	2,700	3	6,000	2	3,500
Blackwood & Gordon ..	6	2,900	yard closed.		1	2,400
R. Duncan & Co. ..	4	4,230	5	9,770	5	6,650
W. Hamilton & Co. ..	2	2,949	3	5,200	1	500

THE FORTH.—Since the enterprise and vigour of the Grangemouth Dockyard Co. were brought to bear upon the shipbuilding industry of Alloa, the river Forth and estuary can boast of at least four ports at which a creditable amount of new tonnage has been produced during the year. Alloa, Grangemouth, Leith, and Kirkcaldy, have together turned out over 32,000 tons, as against about 12,000 during 1888—the work being contributed by five firms. The vessels as a rule were of small tonnage, as things go now-a-days, but several were about medium size, while one launched by Ramage & Ferguson was as much as 3,034 tons, the largest vessel ever launched on the Forth. All the firms are pretty well supplied with work for the coming six months at least, the tonnage on hand, or to begin to, being about 16,000. Doubtless orders will continue to be booked, so that on this eastern river as well as on its great western neighbour, the prospects for the future are very cheering. Although there have been occasional wages disputes and hitches connected with the supervision of workmen, work has on the whole been constant, and the contracts have been kept pretty well to time. The following are the output figures for the several firms:—

	No. of Vessels.	Tons Gross.	Horse Power.
Grangemouth Dockyard Co., Alloa and Grangemouth ..	14	14,047	8,200
Messrs. Ramage & Ferguson, Leith ..	9	13,037	8,375
„ S. H. Morton & Co., „ ..	5	4,060	400
„ Hawthorns & Co., „ ..	2	680	250
„ John Scott & Co., Kirkcaldy ..	3	1,006	4,400

For details as to the size and character of individual vessels we can only refer our readers to the figures supplied to us by builders found elsewhere in this issue. In addition to the new work completed, a number of important steamers were re-fitted, the various firms being kept busy at this branch.

DUNDEE.—Shipbuilding and engineering at this port on the river Tay, which, during the depression of 1885-87 had almost completely vanished, have, during the past two years, but especially during 1889, experienced a welcome revival. The improvement which had early set in in other districts during 1888 only began to be marked in Dundee about the end of that year. Happily this continued and increased as 1889 began, many good orders being then placed, some of them for vessels of exceptionally heavy tonnage, and a degree of activity has since been attained, which is without a parallel in the history of the industry since the “piping times” of 1882-83. At the end of 1888, the shipyard of Messrs. Pearce Brothers was without an order, and that firm having wound up business in 1889, both their yard and foundry were taken over by the enterprising firm of Messrs. W. B. Thompson & Co., Limited, of the Caledon Shipyard, so that the latter have since been fully occupying two yards and affording constant employment to a very large number of workmen. Profiting by the increased prosperity wages have been advanced 15 per cent., and a further gratifying circumstance is that no dispute of any consequence has occurred.

During the year, 13 vessels of 17,568 tons gross, have been launched from the four shipyards of Dundee—Messrs. W. B. Thompson's (two) and that of Messrs. Gourlay Brothers, and of Messrs. A. Stephen & Sons. Compared with 1888 this is an increase of 6,371 tons. Messrs. W. B. Thompson & Co. contributed six vessels of 8,470 tons, Messrs. Gourlay Brothers five vessels of 7,590 tons, and Messrs. A. Stephen & Sons two vessels of 1,508 tons. There are at present on hand 12 vessels of an estimated tonnage of 17,470, as compared with ten vessels of 15,829 tons at the end of 1888, showing an increase for 1889 of 1,641 tons. Of the vessels on hand Messrs. W. B. Thompson

& Co. have seven of an estimated tonnage of 7,170 tons, Messrs. Gourlay Brothers three of about 6,000 tons, and Messrs. A. Stephen & Son two of about 4,300 tons. The marine engineering trade being of course closely associated with that of shipbuilding, the prosperity of the former has been commensurate with that of the latter. During the year fifteen sets of engines of 3,210 N.H.P. have been built by four firms, compared with twelve sets of 1,770 H.P. in 1888. There are on hand at present 13 sets of 2,615 H.P., as compared with 13 sets of 2,395 at the end of 1888.

**ABERDEEN.**—At this northerly port the shipbuilding trade has shown a considerable improvement on previous years' results. The year's work is represented by 11 vessels of 9,380 tons, the largest number and greatest tonnage turned out of the port since 1888. From the orders presently on hand the year now entered upon promises to be as busy as the last one has been. Messrs. Hall, Russell & Co. have contributed to the total for 1889, five steamers, all of steel, with a tonnage of 5,770 tons, three of these being between 1,800 and 1,900 tons each. This firm has also done a great deal of repairing work during the year, amongst other vessels overhauled and refitted being the Glen Line steamer *Glenfalloch*. The work the firm has on hand includes six vessels of 5,560 tons. Messrs. A. Hall & Co. contributed to the past year's total five vessels—one a steel sailing ship—aggregating 3,320 tons, and accomplished a large amount of repair work on their patent slip. The firm have at present on hand two steel steamers, each of 700 tons, a steel trawler of 150 tons, and other smaller work, the total amounting to 1,550 tons. To the year's total Messrs. John Duthie, Sons & Co. contributed two vessels totalling 380 tons, and they have on hand a steel screw steamer of 1,800 tons, and a steel trawler of 130 tons; total, 1,930 tons.

In concluding, it may be of interest to tabulate the total production of tonnage in the several localities. The figures for 1889, together with those for five previous years, are accordingly appended, the increase in 1889 over previous years being considerable throughout all the districts:—

	1889.	1888.	1887.	1886.	1885.
Clyde .. ..	335,200	280,037	185,362	172,440	193,453
Dundee .. ..	17,568	11,197	14,246	3,347	7,858
Leith .. ..	17,766	6,000	4,167	5,340	7,769
Aberdeen ..	9,380	6,640	1,842	1,550	6,246
Grangemouth and Alloa ..	14,047	4,556	1,730	2,627	1,053
Kirkcaldy ..	1,006	1,455	1,920	—	—

**STEEL COALING LIGHTERS.**—Messrs. Edward Finch & Co., Limited, have launched from their shipyard at Chepstow, two more of the 150-ton steel coaling lighters, Nos. 72 and 73 built to the order of the Lords Commissioners of the Admiralty.

**THE NEW TWIN-SCREW DREDGER "G. WARD COLE."**—The new twin-screw dredger, *G. Ward Cole*, recently constructed by W. Simons & Co. for the Melbourne Harbour Commissioners, left the Clyde early in December for the Colonies. The order for this vessel and its sister ship, the *Francis Henty* (now on its voyage to Australia), was sent home in January last, notwithstanding great opposition from the Protectionist party, the authorities being influenced by the success of the dredger *Crocodile* (also built by the Renfrew firm), doing more dredging work than a vessel built in the colony at a cost of more than double that paid for the Clyde-built vessel. From the results obtained in the recent trials of the *Francis Henty* and *G. Ward Cole* the reputation of our home products will be more than maintained. The dimensions of the vessels are as follows:—Length, 160ft.; beam, 32ft.; and depth, 11ft. They are propelled by compound surface-condensing engines of 500 indicated horse-power. The buckets are of steel, and when run at the rate of 24 per minute they raised on trial in the Clyde over 1,200 tons per hour, the average dredging capacity being 600 tons. The bucket ladder dredges to a depth of 35 ft. under water. The builders' patent raised fore-castle and bridge is provided to give facility for working the bow moorings, and also form a very strong connection at the forward part of vessel. The winches are specially adapted for the work, and are triple-gear, each barrel working independently. The cabins for crew are situated on the starboard side of vessel, and those for officers on the port side, the latter being handsomely fitted up with all conveniences. These vessels have been constructed under the superintendence of Mr. W. R. Kinnipie, M.I.C.E., Westminster, and this is the tenth dredging steamer built by William Simons & Co. for Melbourne ar.

### Summary of Shipbuilding Returns of United Kingdom in 1889, arranged in order of Tonnage, built by each Firm.

	Name of Firm.	Place.	No. of Ships.	Total Tonn.
1	Palmer's Shipbuilding Co. ....	Tyne	28	64,669
2	Wm. Gray & Co. ....	Hartlepool	28	58,731
3	Harland & Wolff .....	Belfast	12	56,430
4	Russell & Co. ....	Clyde	21	46,500
5	Raylton, Dixon & Co. ....	Tees	18	40,689
6	Sir W. G. Armstrong & Co. ....	Tyne	15	34,415
7	J. L. Thompson & Sons .....	Wear	13	30,543
8	Ropner & Sons .....	Tees	12	29,441
9	James Laing .....	Wear	11	29,160
10	C. S. Swan & Hunter .....	Tyne	12	28,312
11	Naval Construction & A. Co. ....	Barrow	11	26,847
12	J. Redhead & Sons .....	Tyne	12	26,182
13	Wm. Denny & Bros. ....	Clyde	20	25,290
14	Wm. Duxford & Sons .....	Wear	10	24,150
15	Fairfield & Co. ....	Clyde	8	23,830
16	St. Andrew's Shipbuilding Co. ....	Wear	11	23,565
17	Short Bros. ....	Wear	10	23,419
18	R. W. Hawthorn & Co., Ltd. ....	Tyne	8	22,536
19	Richardson, Duck & Co. ....	Tees	10	21,585
20	Edward Withy & Co. ....	Hartlepool	9	21,015
21	Scott & Co. ....	Clyde	12	20,630
22	R. Stephenson & Co. ....	Tyne	7	20,517
23	Wigham, Richardson & Co. ....	Tyne	12	20,353
24	Earle's Shipbuilding Co. ....	Humber	17	18,455
25	A. Stephen & Sons .....	Clyde	8	18,430
26	R. Thompson & Sons .....	Wear	8	18,175
27	Workman, Clark & Co. ....	Belfast	7	17,710
28	Caird & Co. ....	Clyde	7	16,461
29	Tyne Iron Shipbuilding Co. ....	Tyne	8	15,547
30	John Blumer & Co. ....	Wear	9	15,296
31	Chas. Connell & Co. ....	Clyde	8	15,020
32	Grangemouth Dockyard, A.S. ....	Grangemouth	14	14,047
33	Laird Bros. ....	Mersey	6	13,478
34	Turnbull & Son. ....	Whitby	7	13,146
35	Schlesinger, Davis & Co. ....	Tyne	9	13,029
36	Barclay, Curle & Co. ....	Clyde	6	12,760
37	John Reid & Co. ....	Clyde	6	12,754
38	W. Dobson & Co. ....	Tyne	8	12,501
39	J. & G. Thomson .....	Clyde	3	12,316
40	Bartram, Haswell & Co. ....	Wear	5	11,917
41	D. & W. Henderson & Co. ....	Clyde	6	11,806
42	R. Napier & Sons .....	Clyde	3	11,640
43	R. Duncan & Co. ....	Clyde	7	11,256
44	Blyth Shipbuilding Co. ....	Blyth	8	10,889
45	Osbourne, Graham & Co. ....	Wear	6	10,692
46	Craig, Taylor & Co. ....	Tees	5	10,460
47	A. McMillan & Sons. ....	Clyde	7	10,344
48	Whitehaven Shipbuilding Co. ....	Whitehaven	5	10,041
49	Thos. Roydon & Sons .....	Mersey	3	9,234
50	Wood, Skinner & Co. ....	Tyne	7	8,892
	London & Glasgow Engineering and Iron Shipbuilding Co., Limited .....	Clyde	3	8,660
52	W. B. Thompson & Co. ....	Dundee	6	8,470
53	A. & J. Inglis .....	Clyde	3	8,304
54	Aiken & Mansell .....	Clyde	3	8,140
55	John Priestman & Co. ....	Wear	6	8,037
56	W. Pickersgill & Sons .....	Wear	5	7,950
57	W. H. Potter & Sons .....	Mersey	6	7,698
58	Strand Slipway Co. ....	Wear	4	7,481
59	Chas. J. Bigger .....	Londonderry	5	7,268
60	T. & W. Smith .....	Tyne	7	7,101
61	S. P. Austin & Co. ....	Wear	4	6,951
62	Lobnitz & Co. ....	Clyde	8	6,507
63	Edwards' Shipbuilding Co. ....	Tyne	6	6,000
64	Hall, Russell & Co. ....	Aberdeen	5	5,770
65	Macilwaine & MacColl, Ltd. ....	Belfast	8	5,713
66	D. J. Dunlop & Co. ....	Clyde	5	5,700
67	R. Craggs & Sons .....	Tees	5	5,561
68	Murdoch & Murray .....	Clyde	3	5,269
69	Napier, Shanks & Bell .....	Clyde	4	5,166

**VOLTMETER FOR SHIP-LIGHTING.**

**N**OW that electricity has become the recognised method of illumination for ships, a great amount of time and expense is being expended by electricians to develop every detail of the plant for which such a large demand has arisen.

The usual method of lighting is to take the current direct from an engine and dynamo, supplied with steam from the main boilers, the use of accumulators for ship-lighting being at present limited to the Royal

The Cardew voltmeter has lately been perfected in several details, and has been adopted by the Admiralty as their standard pattern for ship-lighting.

The instrument consists essentially of a fine wire of high resistance, which is connected between the two poles of the dynamo:

It will be seen that any increase in E. M. F. will cause a greater amount of current to pass through the wire, and the increase in heat which this will cause produces a considerable expansion of the wire itself. This expansion is recorded by a suitable magnifying

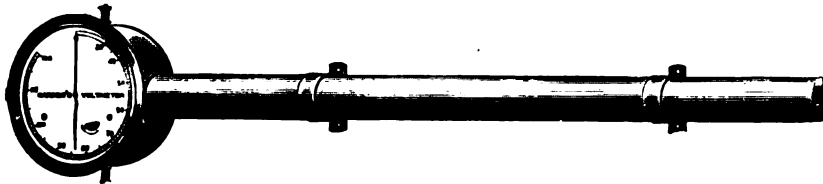


FIG. 1.

yachts and a few men-of-war, where the weight and first cost are not of paramount importance. Where accumulators are used they act as regulators, and tend materially to prolong the life of the lamps by avoiding the excesses of E. M. F., which are caused by the smallest increase of boiler power.

Where, however, a direct system is employed, the engineer has to rely upon his voltmeter to ensure that the proper pressure is being maintained on the lamp terminals, so as to incandesce the carbon filament to exactly the degree which has been found by experiment to be most economical.

device on a large dial, which is marked in plain figures so as to be easily visible from all parts of the engine-room. The motion of the needle, which is very considerable, is therefore quite independent of the movement of the vessel, and is unaffected by any neighbouring wires carrying electricity, or by the magnetism of the ship. A further advantage possessed by this instrument is its absolute compensation for temperature variation, which is a most important feature in engine-rooms which are liable to a considerable range under ordinary working conditions.

The price of the instrument is, we believe £8 8s.,

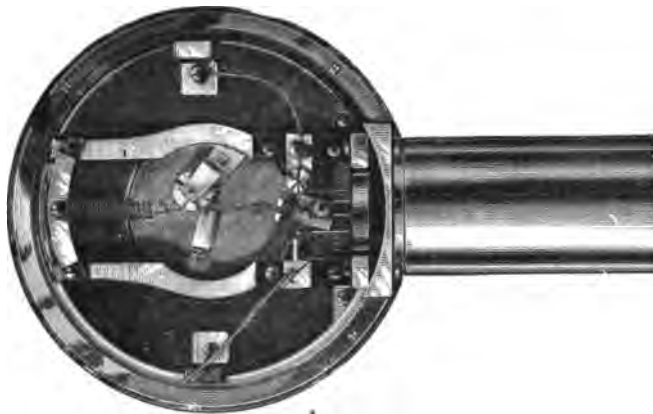


FIG. 2.

It will thus be seen that this instrument is a most important factor for ship-lighting, and until the introduction of the Cardew voltmeter there was no instrument which fulfilled all the practical requirements. In the first place, it will be seen that no form of suspended needle can be reliable, owing to the movement of the vessel; next, the magnetic influence produced by the dynamos on the iron of the ship will tend to produce errors in any form of instrument which depends for its action upon the attraction of a small piece of iron by an electro-magnet, which is the usual method adopted in the cheaper form of instruments sold.

and as it is now understood that the life of an incandescent lamp varies approximately as the 25th power of the E. M. F., it will be seen that the working of the lamps, at even one volt above the economical limits will make a very considerable difference in the account for lamps.

It is therefore a matter of the utmost importance to all shipowners that they should obtain the very best voltmeter that is made.

The firm of electrical engineers who own the Cardew Patents are Messrs. Drake & Gorham, of 2, Princes Mansions, Victoria Street, London, S.W.

### BAILEY'S "INSTANT" GRIP LOCK HOSE COUPLING.

A NEW and very simple form of Hose Coupling (Grether's Patent) has been recently introduced by Messrs. W. H. Bailey & Co., of the Albion Works,

tion which, it will be seen, is about as simple as it is possible for such a fitting to be. It is entirely without springs, bolts, or fragile complications of any kind, so that it is specially adaptable for withstanding any rough usage. In fact there is practically nothing to injure and nothing to get out of condition. One special

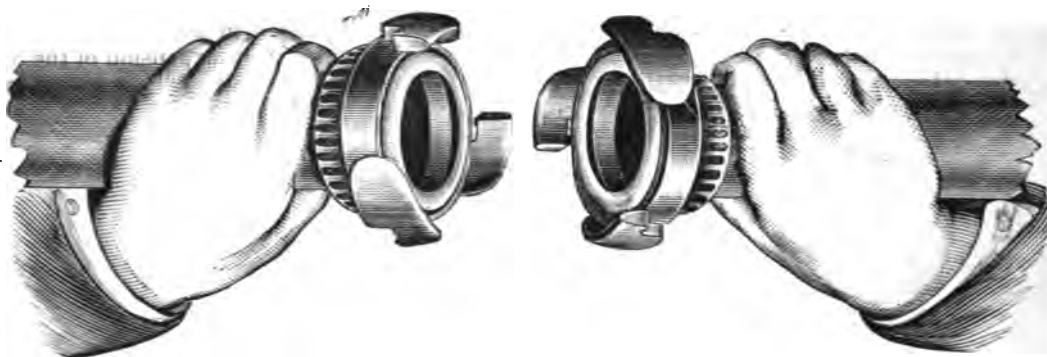


FIG. 1.

Salford, Manchester, which is specially adapted as a hose coupling for use on steamships. In fact, on a number of the Hull steamers it is already in use,

advantage is that both halves are alike, so that there is no fear of getting hold of the wrong end of any length of hose piping in any moment of excitement.

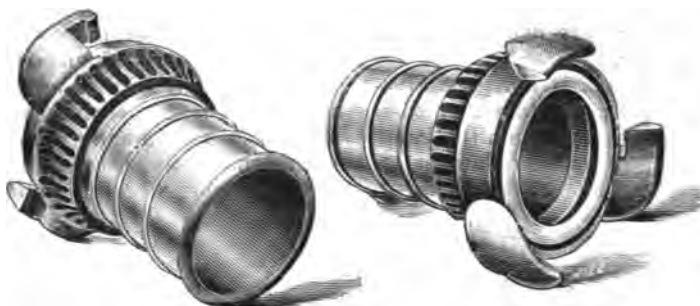
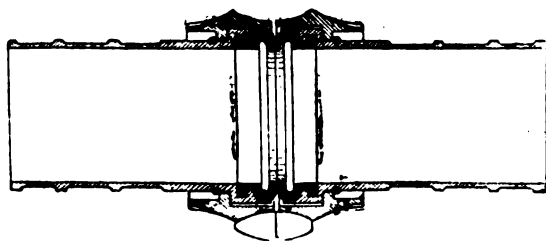
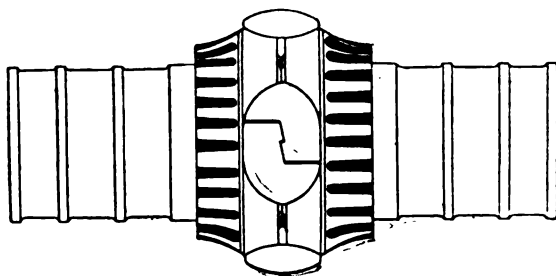


FIG. 2.

and has been found a very handy and efficient coupling for requirements on board ship. The illustrations which we give show very clearly the form of construc-



FIGS. 3 &amp; 4.

In cases of emergency it consequently does not matter which end of a length is first laid hold of as it would be certain to fit that half of the coupling at the end of the previously laid length of piping, a very important advantage over other forms of hose coupling in which there exist male and female socket ends. In addition it can be as quickly locked or unlocked as the best form of hose coupling in the market, a quarter-turn of the wrist being all that is needed in either case. Another special feature to notice which adds to its value is the introduction of indiarubber faces as shown in the illustration. These are cup-shaped, and when pressed together form a perfect joint, their tightness being proportionately increased with the pressure of the water, so that the greater the pressure, the tighter becomes the joint. The illustration Fig. 3 shows the clearance in each grip, with which, by the pressure of the rubber faces against each other, the coupling is effectually locked. Those portions shown black, Fig. 4, are the indiarubber cup-rims; by this illustration the simplicity of the invention will be readily seen.

**NEW GUN VESSELS.**—Two additions were made to the Royal Navy at the close of last month, by the delivery from the contractors of the composite gun vessels *Thrush* and *Sparrow*, which arrived at Sheerness Dockyard from Greenock, under the convoy of the powerful tug *Meteor*.

**MACHINE TOOLS.**

**M**ESSRS. BARIQUAND ET FILS, 127, Rue Oberkampf, Paris, had one of the largest stands devoted to machine tools in the French section of the



FIG. 1.

Machinery Hall of the Paris Exhibition. The firm was founded in the year 1834 by M. Bariquand *père*, and has a great reputation for the manufacturing of machinery capable of executing work with the greatest exactitude. Their workshops are very extensive, containing about 800 machine tools, mostly in continuous operation and driven by two steam-engines respectively of one hundred and one hundred and twenty H.P. Upwards of six hundred workmen find employment in the shops. At the Exhibition, Messrs. Bariquand et Fils had thirty-two machine tools exhibited, and although none were duplicates, they are only representative of a vast variety of machines designed since the previous Paris Exhibition of 1878. Those exhibited, however, sufficed to show the activity and progress which characterises this manufacturing firm. In addition to aiming at compactness in design and general appearance, care has been exercised in turning out machines which would execute duplicate or interchangeable work with exactness, without using special callipers.

Amongst the exhibits were no less than eight different milling machines, all of which had, as common features, a fixed head for carrying the shaft actuating the tool, and a table capable of being moved in longitudinal, transverse, and vertical directions and adjustable to the one hundredth part of a millimètre. One of these tools was a combined horizontal, vertical, and universal milling machine; three were horizontal and four vertical millers.

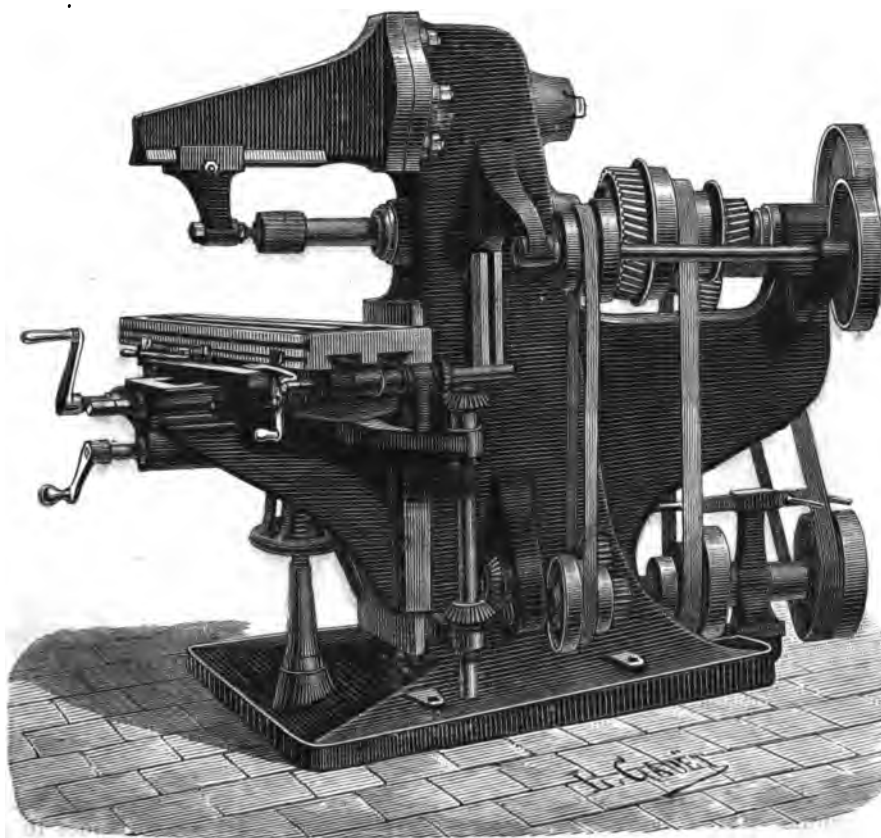


FIG. 2.

In Fig. 1, page 409, we illustrate one of the latter, of which upwards of two thousand have been supplied by this firm to the Manufactures d'Armes de l'Etat. As already indicated, the table of the machine has

Twelve different speeds are obtainable by the use of two sets of cones, and two pairs of geared wheels. The table, which has a rapid automatic return motion, has a longitudinal movement of about 4 ft., a trans-

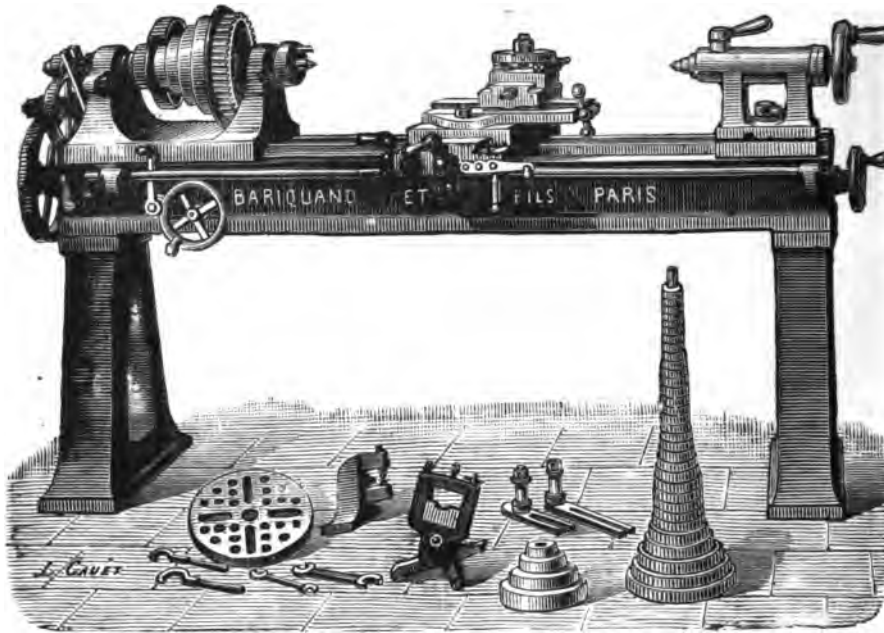


FIG. 3.

verse movements. Longitudinally, it can be moved about 24 in.; transversely, 12 in.; and vertically, 16 in. Provided with the requisite accessories, this is a most useful machine for turning out milling tools, taps, drills, &c.

verse movement of nearly 4 ft. 6 in., and a vertical movement of 1 ft. 6 in.

Besides the eight milling machines already referred to, there were two for special purposes, one of which was for reproducing milling tools of identical dimen-

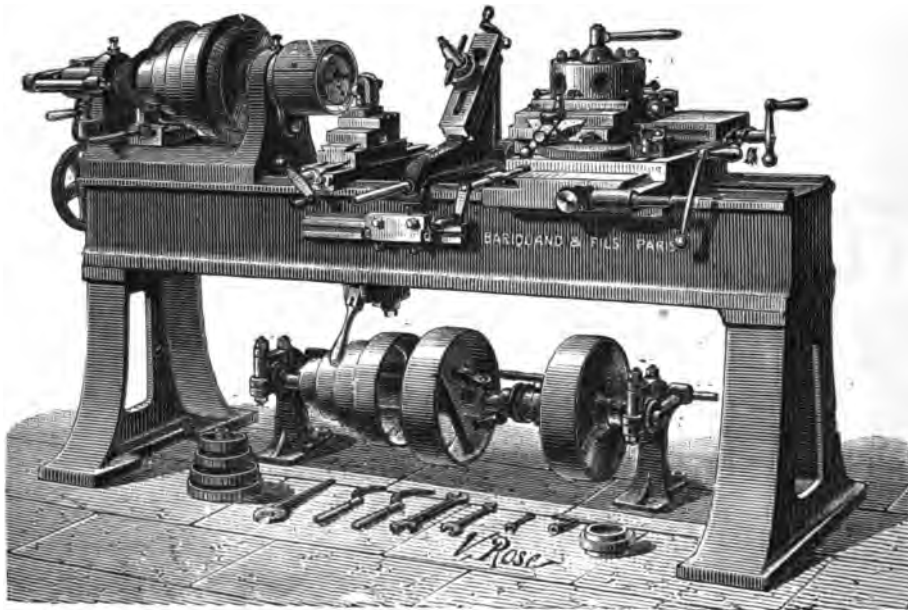


FIG. 4.

In Fig. 2, page 409, there is a representation of a heavier class of machine, viz., a horizontal miller, constructed especially for taking large cuts, and from large gearings for that former purpose gearing.

sions, teeth, &c., from a pattern tool, and the other for milling bayonet sword-blades in one operation by means of four millers, having a simultaneous advance.

Messrs. Bariquand et Fils exhibited eight lathes,

two of which were styled by the firm as being lathes of precision. In Fig. 3, page 410, we illustrate one of these lathes, which it will be seen has a fixed head-stock, a sliding-head, and a turret-rest for the tools. The geared wheels are accurately divided, the standard metre of the Conservatoire des Arts et Métiers being adopted. The spindle of tempered and annealed steel is hollow for its whole length, and the underside of the carriage for the tool-rest has an angular slide at the front, and runs on a plane surface at the back. A large variety of speeds is obtainable by four cones and gearing, the movements being either automatic or regulated by hand, or a combination of both methods. When desired, this lathe is fitted with universal tools for vertical and horizontal milling, drilling, screw-cutting, &c. Another lathe of this

In Fig. 4 page 410 we give a view of one of these lathes, which can accommodate work up to nearly 20 in. in diameter, and the hollow admit bars of about 2 in. diameter. Various speeds are obtainable by means of a lever acting on the cones and geared wheels. Besides carrying a turret rest for five, eight, or nine tools, this lathe is fitted with an attachment for cutting off or working on the ends of bars immediately in front of the chuck. The carriage of the tool turret has an automatic movement, and can also be controlled by hand, and has five slides, of which two have a circular motion. The lower slide carries the pivoting tool-rest, and the travel of this slide is regulated by means of stops to the one-fortieth of a millimetre, whilst the arrangement admits of various diameters being worked by the same tool.



Fig. 5.

type was exhibited, intended for lighter work, motion being given by a treadle, and capable of taking in work nearly a foot in diameter.

Messrs. Bariquand et Fils also exhibited two lathes of the type known as "crank shaft" lathes, one of which was capable of taking in work up to 18 in. diameter, and the other over 2 ft. 6 in. diameter. The latter is constructed with special strength, being largely supplied for turning up guns, and the cutting-tool is constantly supplied with soap and water or oil by means of a pump.

There still remains to be mentioned other four lathes, two of which are designed for large screw making, with automatic action, while the others are specially designed for railway work, and are largely used in the workshops of the eastern railways of France.

Drilling and tapping machines, four in number, were also to be seen on Messrs. Bariquand et Fils' stand, one of which we illustrate in Fig. 5, page 411. It has been specially designed for drilling at a high speed, and will take drills of one to twelve millimetres in diameter. The gap of the machine is about 12 in., and work 18 in. in depth can be admitted, the table, which is provided with three grooves for securing work, being movable in a vertical direction. The tool is thus specially adapted for drilling small holes in relatively large castings or forgings, and it is so designed that drilling at a high speed can be executed with a *minimum* danger of breaking the drills. The spindle and geared wheels are of steel of the best quality, and the descent of the drill is limited by an adjustable stop, causing an immediate reversal of the movement of the tool when the desired depth has been reached.

A rimring and countersinking machine, a slotting machine, and a machine to extract oil from filings we must reluctantly pass over, owing to pressure on our space. In Fig. 6, page 412, we illustrate a machine for straightening bars. This machine, which is driven by belting, is designed to automatically straighten wire rods of one to four millimètres in diameter after they have been approximately straightened by a mallet. The rod having been threaded into a tube, its projecting end is entered between the three small rolls shown projecting at the left of the illustration. The tube is so inclined as to subject the rod to a slight strain, and the rolls are tightened in front by means of mandrils to securely grip the end. After passing through the rod is perfectly straight, if the tightening

### ZEPHYR LAUNCH.

**A**MONGST the vessels exhibited afloat during the Paris Exhibition on the River Seine, abreast the *Quai d'Orsai*, was one of Messrs. Yarrow & Co.'s, of Poplar, *Zephyr* launches, which we have pleasure in illustrating on page 413.

Whatever may be the future fuel of our steamships, and whether petroleum will ever displace coal, it is year by year becoming more evident that there is a wide field of usefulness already existing for petroleum in which it not only takes the place of coal as fuel, but also that of water as the liquid from which the vapour is raised, for giving motion to the machinery.

It is now about two years since Messrs. Yarrow & Co.

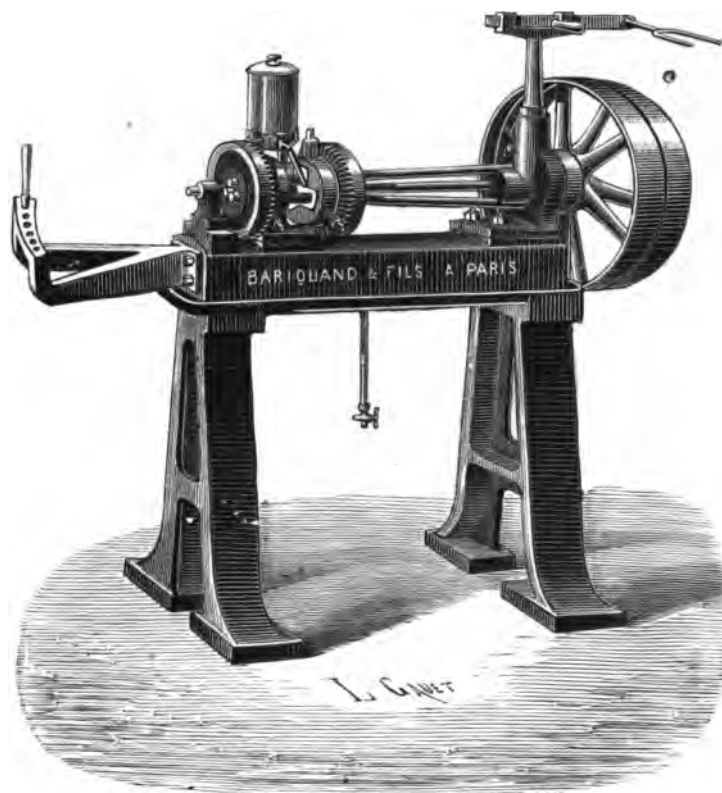


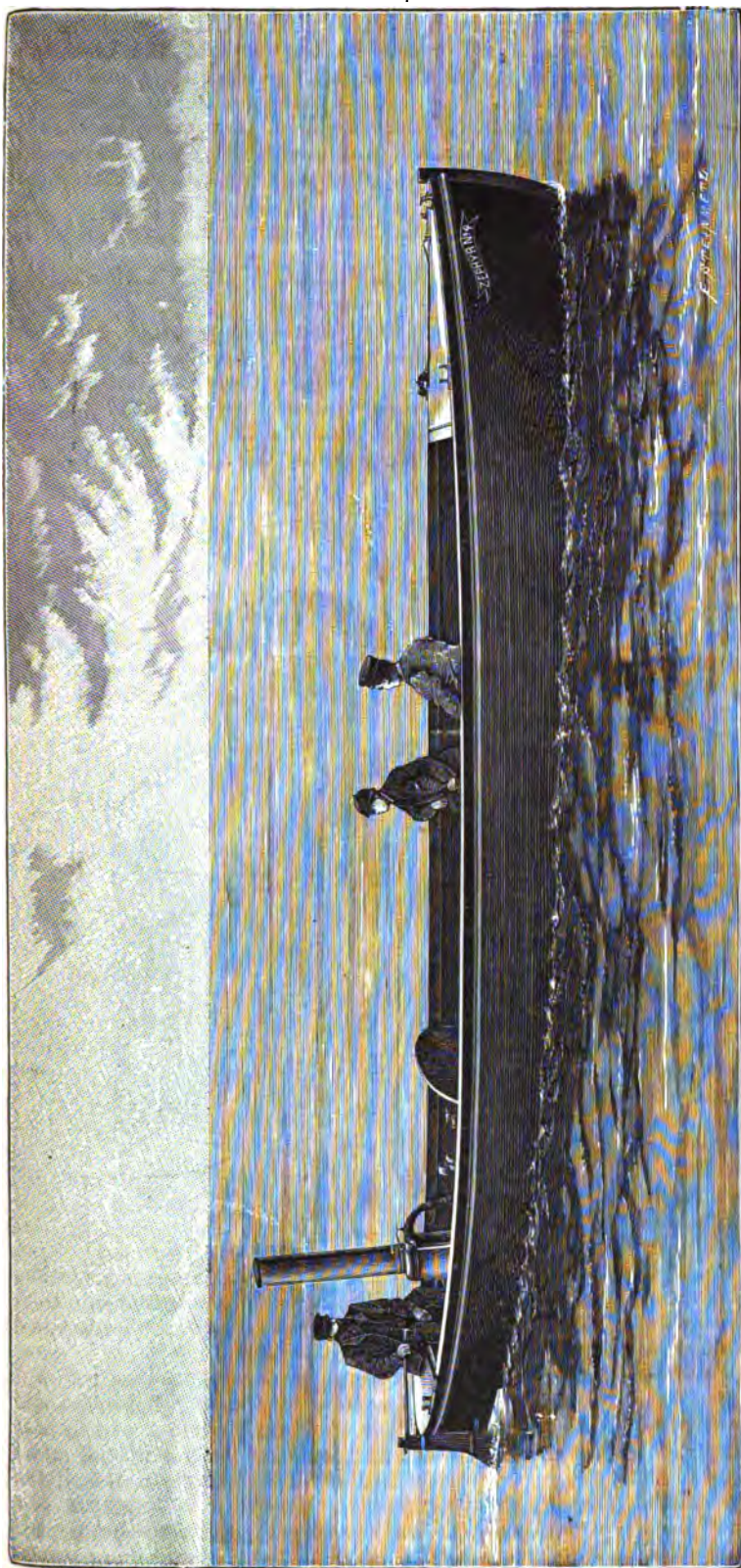
FIG. 6.

of the rolls and the inclination of the feeding tube have been suitably adjusted.

Besides the machine tools we have noticed, Messrs. Bariquand et Fils exhibited a large number of measuring instruments and gauges, including a gauging bed, permitting of measurements being made to the one hundredth part of a millimètre; as well as a large collection of all kinds of accessories for the various machines, and specimens of milled work which had not been re-touched after leaving the machine. Altogether, as can be gathered from our description, the display of Messrs. Bariquand et Fils was highly creditable, the workmanship and material being of the highest class, carefully tempered steel being used to a large extent in their construction.

first commenced to construct petroleum engines of this type, which have, it must be remembered, nothing in common with engines of the "gas" type, in which a series of explosions give the motion to the mechanism. As already indicated, the *Zephyr* system more nearly approaches that adopted in the ordinary steam engine, nay, it may be said to be identical, except that instead of vaporised water, the vapour generated by heating petroleum spirit is employed in the cylinders.

In our limited space we cannot detail the various experiments which were carried out by Messrs. Yarrow & Co. prior to their placing on the market their *Zephyr* launches, but it is worthy of note that results were repeatedly obtained, showing that an engine always made at least



twice as many revolutions with petroleum spirit vaporised as it did with steam. Even more favourable results were obtained in the comparative trials of engines fitted to *Zephyr* launches, which can be worked with either ordinary steam or vaporised petroleum spirit. With the latter 3 to 4 H.P. has been obtained, while with ordinary steam only 1 to 1½ H.P. was given out, the consumption of paraffin oil as fuel being the same in both cases. These are truly remarkable results, and if the system were applicable to ordinary marine engineering, it would, in all probability, soon work a revolution in steam shipping. What, however, is possible and practicable in a small way, is unfortunately not always capable of being accomplished on a relatively gigantic scale. The difficulty of constructing a generator of large dimensions in which to vaporise so volatile and searching a spirit as refined petroleum has as yet to be solved.

The *Zephyr* system has, however, already been abundantly proved to be a practical success in its present applications, upwards of thirty *Zephyr* launches having been constructed up to date by Messrs. Yarrow & Co., Poplar, and this firm is at present constructing additional ones as rapidly as possible to meet the continued demand that has arisen.

The *Zephyr* launches are constructed of various dimensions and materials, to suit the requirements of owners, one of the smaller sizes being exhibited at the Paris Exhibition, and from which our illustration is taken. It is 20 ft. in length over all, 5 ft. beam, and about 2 ft. 6 in. in depth, constructed with keel, stem, and stern post of oak, and with mahogany planking. The engine has three cylinders, placed vertically, indicating about 2 H.P., on a consumption of ¾ of a gallon of petroleum per hour, equivalent to about 2½ to 3 lbs. per H.P. per hour.

In the earliest *Zephyr* launch, the fuel and the working fluid were the same, both being supplied from the same tank; but as the storage of large quantities of gasoline is not unattended with certain risks, and as this liquid cannot be readily obtained in all localities, Messrs. Yarrow & Co. have altered their original design, and now frequently only use the gasoline as the working agent, utilizing any common form of petroleum as fuel. By this means economy as well as safety has been attained, as well as reliability of supply of fuel.

The boiler consists of a coil of copper piping, below which is a burner, to which petroleum oil is forced by means of a hand air-pump, a pressure being set up in the air space above the mineral oil in the tank, about 5 lbs. pressure to the square inch being found sufficient for the purpose. At first a small petroleum lamp is lighted, which heats the petroleum and gasifies it before it issues from the burner; when, however, the latter is ignited and the furnace started, the heat of the flame acts on the liquid fuel before it emerges into the fire-box, and the oil is thus gasified. The gas is mixed with air, so that the flame is non-luminous, perfect combustion being obtained in the same manner as in a Bunsen burner. A few strokes of the hand air-pump at infrequent intervals suffices to keep up the supply of fuel, of which, in the *Zephyr* launch exhibited, thirty gallons was stored in the supply tank, sufficient to enable the craft to traverse 250 miles without renewing its supply of fuel, at the speed of  $6\frac{1}{2}$  miles an hour.

A valve in the pipe through which the petroleum passes to the burner, regulates the speed of the vessel and the consumption of the fuel, and doubtless the absence of waste of fuel in getting up steam, and keeping banked fires, &c., has largely to do with the low consumption of fuel. In this craft steam, or to speak more correctly, petroleum vapour, sufficient to drive the propeller at its normal speed of 260 to 280 revolutions per minute, has been raised in four minutes.

As already indicated, the gasoline in the copper coil forming the boiler is there generated into vapour, from whence it passes into the engine, which may be of any type, and after doing duty, it is again condensed in a tube laid outside the hull, close to the keel, from whence it is fed automatically into the boiler again and again by a pump on the engine, after passing through a close-sealed tank, which does not require to be opened except for supplying additional gasoline, to replace any that might have escaped by leakage from the glands of the engine. The leakage, if any, is found to be very small, there being an entire absence of smell close to the engine. Provision is however made to economise any waste from the stuffing boxes, lantern brasses being fitted, and from each lantern brass a small tube is led to the condenser.

As compared with ordinary steam launches the *Zephyr* system has important advantages. There is much better accommodation for the passengers, as the machinery only occupies a small portion of the boat at the stern. There is greater comfort, as there are no smuts, no smoke, no blowing off of steam. A striking feature of the machinery is its light weight, and the total weight of the *Zephyr* launch exhibited at Paris, with full complement of fuel, was only 10 cwt. to 12 cwt.; so that for transporting overland or sea these launches are specially suited, being about half the weight of ordinary steam launches. Attention has been directed to the short time in which these craft can be got under way, when everything is cold, the time occupied from the moment that the order is given to start until the boat is in motion being four to six minutes; when, however, the machinery is warm, the fire only being extinguished for a temporary stay, &c., the craft can be in motion again in about one minute.

There appears to be no doubt that there is a practical immunity from explosion, owing to the gasoline being hermetically stowed, and being limited to a gallon or so in quantity. The tank containing the gasoline is placed in the bow of the boat, and divided from the central portion by a watertight bulkhead. Forward of this bulkhead there is a space open to the water, so that even in case of collision, when the tank might be broken, the gasoline will not find its way into the boat, but will flow direct into the sea.

### INEXTINGUISHABLE SHIPS' LAMPS.

IT has been our duty, as well as pleasure, from time to time to chronicle the improvements made in ships' signal lamps, but hitherto we have not met anything so effective as the lamp invented and patented by Mr. E. Martin, of Martin & Co., Nautical Braziers, &c., of Garford Street, and West India Dock Road, London.



The reliability of a ship's signal lamps is so vital a point in her equipment, that any improvement in their efficiency is a matter of considerable interest to those "who go down to the sea in ships."

The main feature in the construction of Mr. Martin's lamp is an inner front casing, holding a still inner plain glass lens, the upper portion of this case being continued with a bend to form a shield, under the inner mouth of the funnel, between it and the light. Any wind blowing down the funnel strikes this shield-plate and is thereby deflected through the lamp, between the cases of the outer and inner lenses, and finds vent at the bottom of the lamp. This deflection serves the double purpose of diverting the wind

from the flame and keeping the outer coloured lens cool, freeing it entirely from the risk of being cracked when splashed by shipped seas, as other lenses are, owing to their heated surface.

We give an external view of the lamp, which, of course, is manufactured as a port and starboard one, and although it does not externally differ much from the ordinary ship lamp, yet the internal conformation is so effective and yet so simple, that although its ingenious author has supplied us with a sectional drawing, we deem it, in his interest, only prudent in the meantime to withhold it.

The efficiency of the lamp has been subjected to almost unfair trials; but it has passed through them all triumphantly. It has been blown upon by a strong blast, passing through a five-inch pipe from a fan driven at a speed of about 6,500 revolutions per minute; and although the blast was concentrated over the head of the lamp, and then conveyed into the lamp itself, the light remained unaffected, an ordinary signal lamp being immediately blown out under a far less severe test. It has been blown upon from beneath, even when the blast was so strong as to necessitate the lamp being held, to prevent its being blown away. It has been played upon with hose, with the top of the lamp open; it has been even immersed in water to the depth of ten feet, and subjected to all manner of tests, but by none of these means could the light be put out.

On the invitation of Mr. F. W. Prescott, of the firm of Messrs. Prescott & Co., Shipping Agents, Dover, we had an opportunity of witnessing a most exhaustive test of the efficiency of Mr. Martin's lamp. Mr. Durden, Harbour Master of Dover, by the kind permission of the Harbour Board, placed the steam tug *Lady Vita* at Mr. Prescott's disposal, and a series of trials ensued which more than upheld the claim of the inventor. Among those present at the trial were Mr. Carver, representing the Board of Trade; Mr. Parish, representing Trinity House; Councillor Cullin, Captains Lambert, Coughlan, Dorall, Wood, Phillips, and Minter, and the majority of the captains of ships lying in Dover Harbour; and among the letters of apology read was one from E. S. Norris, Esq., M.P., who takes a great interest in Mr. Martin's lamps, as a further preventative of the sad loss of life which so often takes place at sea, simply from lights being blown out in even a three-sheet wind.

The first trials were to place two of the lamps upon the *Lady Vita*, and to play upon them with a hose. Although literally swamped, neither the water or its force had any apparent effect upon the light. Next, the tops of the lamps were opened, and the same tests used in this case, the nozzle of the hose being placed on the open top of the lamp. It was then successfully subjected to the other tests we have already mentioned.

A ship's lamp, while possessing all these very valuable qualities, would be at a discount were it not also a good illuminating power. This was tested by comparison with the lamps of the *Lady Vita*, which are of the very best used in the Mercantile Navy, and those who were witnessing the experiments crossed to the Wellington Bridge to obtain a distant view of the lamps, and both showed a very much stronger and brighter light than the Harbour Lights now in use. The company then adjourned to Messrs.

Prescott's offices, where the construction of the lamps was explained.

One great feature of these lamps, which we must not omit to mention, is that they are much cheaper than those in ordinary use, and also that they have been adopted by the Board of Trade for testing other lamps.

A lamp that cannot be blown out by a gale of wind, or drowned out by water, is certainly an acquisition to our Navy, whether combative or otherwise.

### ELECTRIC LIGHT INSTALLATION ON BOARD THE S.S. "WAESLAND."

THE above steamer, owned by the International and Red Star Line, at present being fitted with triple-expansion engines by Messrs. J. & J. Thomson, Glasgow, has been fitted throughout with the electric light by Messrs. J. H. Holmes & Co., of Newcastle, London, Liverpool, and Glasgow.

The generating plant consists of a 15 L "Castle" dynamo and vertical engine, illustrated on page 416, constructed on Messrs. Holmes's low-speed coupled-direct system. The plant is designed to give an output of 105 volts, 130 amperes, 212 revolutions.

The armature, of improved modified gramme type, is built up of thin plates of Swedish iron rings insulated from each other, wound with rectangular conductor composed of laminated copper strip.

The commutator is of hard drawn copper, insulated by mica, and having an extra large brush-surface. The current is taken off from the commutator by means of brushes made of copper gauze, lubricated in a special manner, and a spring pressure is maintained by brush holders which have an adjustable parallel thrust, so that the angle of the brushes never alters with the wear.

The dynamo bearing has a long phosphor-bronze bush held in its support so as to automatically adjust itself in a line with the engine bearings. A special sight-feed lubricator is fitted which secures continuous lubrication of a definite quantity.

The field magnets are made of soft wrought-iron bars which have been annealed with great care, so as to secure the utmost magnetic permeability. The yoke is of cast-iron, but of increased section, so that the lines of force are not throttled there. In order to provide polar extensions for the armature to revolve in, cast iron sleeves are fitted on the round bars. The yoke is so arranged that the field magnets can be divided and one half removed by merely taking out the bolts which clamp the yoke together without interfering at all with the connections, so that the armature may be removed sideways.

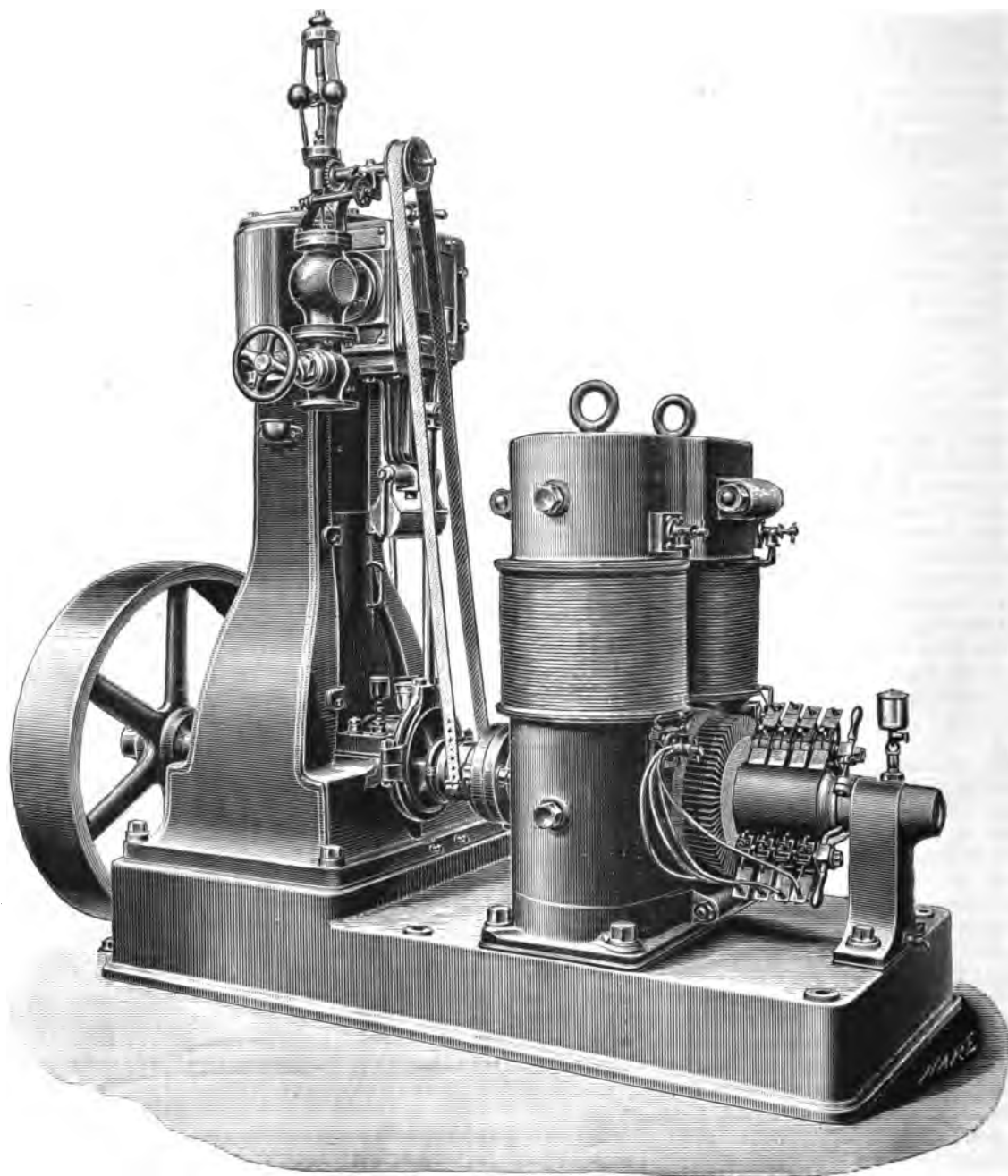
The self-regulation of this machine is so perfect that the volts do not vary more than two per cent. between no load and full load.

The engine, specially designed for the purpose, is of strong compact form, with all the wearing parts of large surface, with balanced crank and adjustment to the various parts; the lubrication is so arranged as to secure a minimum of attention for continuous running. The governor is of "Pickering" type.

The whole forms a plant where every part is easy of access and soon understood by the ordinary marine engineer.

There are over 200 lights installed in all. The fittings in the first-class accommodation, saloons, passages, &c., are electro-plated and of an ornamental design, mounted on polished hardwood bases.

all the T joints being in cast-iron boxes, carefully insulated and protected. The fittings also are of a special description, and constructed to stand the rough usage they may be subjected to in such positions.



"CASTLE" DYNAMO AND VERTICAL ENGINE.—See page 415.

The second-class are bronzed, of a chaste pattern, and similar to those fitted in the first-class; all the emigrant and crew space, as well as the engine-room, stokehole, tunnel, &c., are wired throughout with armoured cable which is practically indestructible;

In the parts of the ship which are occasionally filled with cargo, the fittings are portable and can be easily removed.

Portable lights with strong brass coupling-sockets are fitted in the engine-room, while the cabins of the

chief officers as well as the chart-room are fitted with neat electro-plated portable lights.

As a whole the installation is a very complete one, and carried out in a manner that will, we have no doubt, give every satisfaction to the owners; no trouble or expense has been spared to render it electrically and mechanically perfect.

We understand the work has been carried out under the supervision of Mr. R. D. Smillie, Electrical Engineer, of Glasgow, who manages Messrs. J. H. Holmes & Co.'s Glasgow business.

### PUMPS SPECIALLY DESIGNED FOR STEAMSHIP PURPOSES.

**W.** H. BAILEY & CO., of the Albion Works, Salford, Manchester, have long been well-known for the various types of pumps which they have introduced to the market, and recently they have



FIG. 1

brought out one or two special designs particularly adaptable for steamship purposes. Steam pumps of the "aqua-thruster" type, somewhat similar to that illustrated in block Fig. 1, have for some years been generally adopted for ballast and for steamship purposes. As will be obvious, they are always ready for work, and oftentimes arranged so that the tanks—fore and aft—may be filled or emptied at will, one connection of pipes only being used for the purposes of suction or discharge. The "Aqua-thruster," Fig. 1, is capable of taking an extremely long vertical suction, so that it may be placed on the upper-deck adjacent to where the auxiliary steam power is employed, or in any other convenient place. The illustration shows the general internal arrangement of Bailey's "aqua-thruster," which is the most recent improvement in this special type of pump, as well as the facility with which the chambers may be cleared of incrustations, and the advantages possessed by this design as regards the steam space will be readily seen. This enables the delivery force to be of greater volume with less consumption of steam than any other form of pump working upon this principle. The mode of working is also shown, and it will be seen that the left-hand chamber is filled while the right is being emptied by the steam which is being admitted past the oscillating valve in the bridge of the pump. By the time the right-hand chamber is empty, the left one has become full, and it only needs condensation to take place in the right-hand chamber (a vacuum thus being formed) to draw the oscillating valve to the right, and thus allow steam to empty the left chamber while the right is filling. Amongst other special advantages claimed for this pump are that it will work with a longer suction and force higher, that it consumes less steam, occupies less space, and is lighter in weight by reason of its design than other pumps of this type, whilst it needs no attention, no lubrication, and no costly repairs. In addition, it affords ready access to all the valves from the one position without the breakage of pipe joints. As a steamship pump, and for use as a floating fire pump for harbour duty, also for docking and wrecking purposes, the "aqua-thruster" is certainly particularly suited, and it is capable of raising from 5 to 500 tons of water per hour. As an auxiliary pump for steam yachts, pinnaces, light draught steam boats, &c., it is also exceedingly valuable because of its readiness and certainty of action after being fixed.

Another form of pump also adaptable for steamship purposes, manufactured by Messrs. Bailey, is the Davidson Patent Double-Acting Steam Pump, of which we give an illustration in Fig. 2.

The special features of this pump may be described as follows. At the steam end, unlike other direct-acting steam pumps, it has only one valve in the steam chest. This may be called a compound-slide valve, which performs two duties, that of the ordinary slide-valve and of the auxiliary valve combined. Its duty as a slide-valve is to reciprocate across the steam ports, to admit steam alternately to the two ends of the steam cylinder, and as an auxiliary valve it is oscillated so as to open and close the steam ports that lead to the end of the steam chest. The steam chest is bored out to make a face for the slide-valve, and to receive the pistons that assist in operating the valve. The pistons

are connected together, sufficient space being allowed between them for the valve and steam ports, and they are also connected to the slide-valve, all working in the same place and being of the same diameter, thus ensuring evenness of wear and readiness of access for adjustment or repairs, &c. By the special arrangement of the valve, the probability of its getting out of order, becoming damaged or wearing out within the life of any other portion of the pump, is effectively prevented. The valve is oscillated by a cam connected with the valve by a steel pin passing through the valve into the exhaust port, in which the cam is placed. The moving of the valve does not depend entirely upon the steam admitted to the end of the piston, for should that not be quick enough to operate the valve with the pump under a high rate of speed, the cam is so constructed that it will carry the valve mechanically and

length of the stroke remains constant. It is perfectly noiseless, and being absolutely positive, will start from any position—a necessary feature in a pump when used for automatic duty, such as operating hydraulic elevations, presses, connectors, etc., or when used at slow speed for boiler feeding, and at quadruple or greater speed for fire purposes. The water end of the pump is of entirely new design, and is the only improvement that has been made in this end of the steam pump for the last twenty years. It has but one joint to blow out, this being in plain sight, and the arrangement is certainly the most simple possible. These pumps are readily examined, as the water valves and the whole inside can be got at by the removal of one plate, and it can be taken apart and put together again in two minutes, whilst the construction is such that the area of valves can be enlarged for any duty.

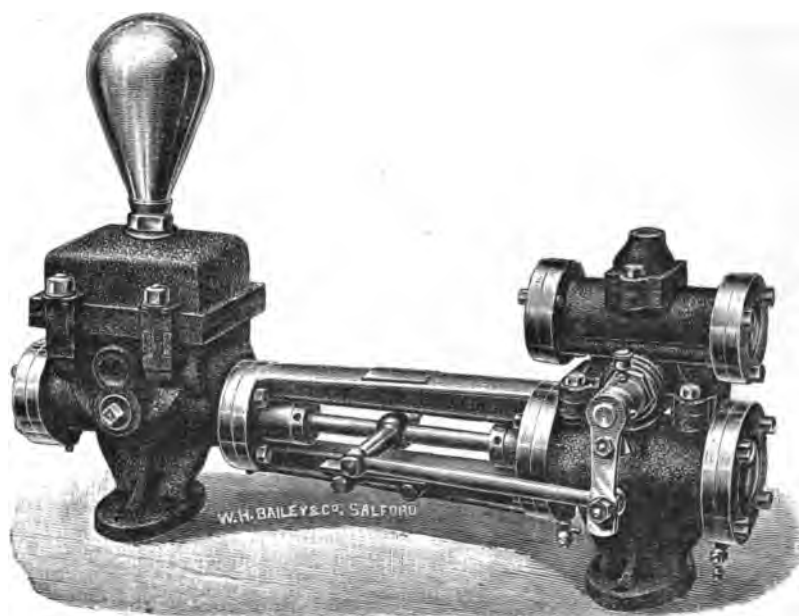


FIG. 2.

thus prevent the piston from striking the cylinder heads. This, it is claimed, is one of the most important features of the pump, the valve being as much under the control of the piston-rod as is the valve of the ordinary steam-engine, worked by an eccentric instead of being independently controlled by an auxiliary valve. The number of strokes per minute which this pump can be run without danger it is further claimed is entirely without precedent in any direct-acting steam pump. It can also be run as slow as any of the other pumps, and as the time required to overcome the inertia of the valve and plunger remains constant, whilst the distance moved by the pump piston varies with the velocity, it follows that the

Messrs. McINNES BROS., of 8, Buchanan Street, Glasgow, manufacturers of engineering and nautical instruments, forward us their revised catalogue and price list, from which we gather much that is of interest and value regarding their varied manufactured specialities in the way of engine indicators, gauges and counters, timepieces and chronographs, speed indicators, sight-feed lubricators, and the hundred and one items which go to contribute the outfit of a ship's machinery room and chart room. Messrs. McInnes are sole agents in Scotland for Messrs. J. R. Harding & Sons, of Leeds, and Scottish agents for Messrs. Elliott Bros., of London, and the catalogue contains, in addition to Messrs. McInnes' own manufactures, admirable illustrations and useful particulars as to these firms' well-known specialities. The book is very neatly got up, and admirably suited to supply the needs of firms who believe in knowing thoroughly beforehand the nature, quality, and price of what they purchase.

## ✓ LIST OF VESSELS LAUNCHED IN 1889.

## ENGLISH.

By WM. DOXFORD &amp; SONS, Pallion, Sunderland.

Name of Vessel.	Built of	Class	Owners.	G.T. Regis.	H.P. N.
† Joseph John ..	Steel	Steam	British	2,100	200
† Wm. C. Mitchell ..	"	"	"	1,850	160
† Foyle ..	"	"	"	2,100	225
† Mamari ..	"	"	"	3,600	450
† Parahya ..	"	"	Foreign	2,600	250
† Alphonse Farran ..	"	"	British	1,900	160
† Setiembre ..	"	"	Foreign	2,300	200
† Sarmatia ..	"	"	British	2,100	200
† Benisaf ..	"	"	"	1,900	160
† Maori King ..	"	"	"	3,800	450

By OSBOURNE, GRAHAM &amp; Co., Hylton, Sunderland.

† Argo ..	Steel	Steam	Foreign	1,103	110
† Regulus ..	"	"	"	1,103	110
† Somerton ..	"	"	British	2,198	180
† Torridon ..	"	"	"	1,717	140
† Colonist ..	"	"	"	2,286	190
† Llanberis ..	"	"	"	2,286	190

By COCHRANE, COOPER &amp; SCHOFIELD, Beverley.

† Ulysses ..	Iron	Steam	British	165	50
† Azalia ..	"	"	"	165	50
† Begonia ..	"	"	"	165	50
† Cineraria ..	"	"	"	153	50
† Dahlia ..	"	"	"	153	50
† Rob Roy ..	"	"	"	154	45
† Geland ..	"	"	"	144	45
† Pochard ..	"	"	"	144	45
† Helen McGregor ..	"	"	"	156	50

By THE WHITEHAVEN SHIPBUILDING Co., Whitehaven.

† Raveri ..	Iron	Steam	British	872	84
† Ponani ..	"	"	"	872	84
† Windermere ..	Steel	Sail	"	2,833	—
† Alice A. Leigh ..	"	"	"	8,003	—
† Engelnhorn ..	"	"	"	2,461	—

By WILLIAMSON &amp; SON, Workington.

Wray Castle ..	Steel	Sail	British	1,891	—
Andelana ..	"	"	"	2,512	—

Also a small steamer about 300 tons.

SCHLESINGER, DAVIS &amp; Co. Wallsend, Newcastle-on-Tyne.

† Southwark ..	Steel	Steam	British	535-07	75
† Benwick ..	"	"	"	2721-54	180
† Bentala ..	"	"	"	2687-79	180
† Ringmoor ..	Iron	"	"	248-55	60
† Leconfield ..	Steel	"	"	2237-34	170
† Sullamut ..	"	"	Foreign	3690-63	430
† Victor ..	"	"	"	294-61	35
† H. C. Christensen ..	"	"	"	309-61	35
† Beaver ..	"	"	British	309-61	35

By W. H. POTTER &amp; SONS, Queen's Dock, Liverpool.

† Sierra Ventana ..	Steel	Sail	British	1,853	—
† Alcyone ..	Iron	"	Foreign	2,219	—
† Falkland ..	"	"	British	2,804	—
† No. 1 ..	"	"	"	274	—
† No. 2 ..	"	"	"	274	—
† No. 3 ..	"	"	"	274	—

By T. TURNBULL &amp; SONS, Whitby.

† George Clarkson ..	Steel	Steam	British	1,806	140
† Concord ..	"	"	"	1,811	140
† Eastgate ..	"	"	"	1,675	140
† Illyd ..	"	"	"	1,678	140
† Parkgate ..	"	"	"	2,241	175
† Zoe ..	"	"	"	2,255	200
† Oswin ..	"	"	"	1,680	140

By R. &amp; J. EVANS &amp; Co., Brunswick Dock, Liverpool.

Talca ..	Iron	Sail	British	1,136	—
Holyhead ..	"	"	"	2,336	—

\* Compound.

† Triple.

‡ High Pressure.

By JOHN BLUMER &amp; Co., North Dock Shipbuilding Yard, Sunderland.

Name of Vessel.	Built of	Class	Owners.	G.T. Regis.	H.P. N.
† Siggen ..	Steel	Steam	Bergen	2,258	190
† Girgenti ..	"	"	Hamb'g	1,548	140
† B. T. Robinson ..	"	"	Whitby	1,844	165
† Garnet ..	"	"	London	1,470	120
† Trafalgar ..	"	"	"	1,589	120
† Rydal Holme ..	"	"	Maryp't	1,930	165
† Pallki ..	"	"	Cephalonia	1,597	120
† Zweena ..	Iron	"	Liverp'l	1,470	165
† Camperdown ..	Steel	"	London	1,590	120

By T. RYDEN &amp; SONS, Queen's Dock, Liverpool.

† Rossmore ..	Steel	Steam	British	4,455	450
† Hollinwood ..	"	Sail	"	2,673	—
† Tronto ..	"	Steam	"	2,106	150

By W. PICKERSGILL &amp; SONS, Southwick, Sunderland.

† Agosto ..	Steel	Steam	Foreign	1,762	180
† Inca ..	Iron	Sail	British	1,059	—
† Sobraon ..	Steel	Steam	"	2,385	230
† Bluebell ..	"	Sail	"	845	—
† Sicilia ..	"	Steam	Foreign	1,899	170

By CRAIG, TAYLOR &amp; Co., Stockton-on-Tees.

† Tancerville ..	Iron	Steam	British	2336-45	200
† Reindeer ..	"	"	"	1911-71	150
† Wyndcliffe ..	"	"	"	1939-79	150
† Petrolas ..	"	"	"	2330-87	200
† Sir Walter Raleigh ..	"	"	"	1934-24	150

By S. P. AUSTIN &amp; SON, West Dockyard, Sunderland.

† Barrier ..	Steel	Steam	Colonial	2,086	200
† Vesta ..	"	Sail	"	1,453	—
† County Derry ..	"	Steam	British	1,897	160
† Barola ..	"	"	"	1,565	150

By EDWARDS' SHIPBUILDING Co., Limited, Howden-on-Tyne.

No. 45 ..	Iron	—	British	150	Hop'r
" 46 ..	"	—	"	150	"
" 47 ..	"	—	"	150	"
† Tormore ..	Steel	Steam	"	1,750	160
† Hanover ..	"	"	"	1,700	160
† Kilmore ..	"	"	"	2,100	260

By STRAND SLIPWAY Co., Sunderland.

† Athalie ..	Steel	Steam	Bergen	2,158	150
† Washington ..	"	"	London	1,194	130
† Eva ..	"	"	"	1,276	130
† Specialist ..	"	"	"	2,853	230

By NEWALL &amp; Co., St. Philip's Iron Works, Bristol.

† Deseado ..	Steel	Steam	Ar'tine	200	40
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By STEWARD &amp; LATHAM, South Docks Iron Works, Poplar.

† Yarta ..	Steel	Steam	British	240	50
* Result ..	Iron	"	"	85	45
* Sixty ..	"	"	"	65	40
* Sixty-One ..	"	"	"	65	40

By E. CLARK &amp; Co., Brimscombe, Stroud, Glos.

* Oxford ..	Steel	Steam	British	20	16
† Peggy ..	"	"	Spanish	—	1½
† Donovan ..	"	"	"	—	3
† Pinnace ..	Wood	"	British	—	3
* Firefly ..	Steel	"	S. Am'n	15	10
Launch ..	"	Electric	British	—	—

By EDWARDS &amp; SYMES, Millwall, E.

* Escort ..	Steel	Steam	British	234	150
* Noemi ..	"	"	Foreign	40	15
Cardinal Wolsey ..	"	"	British	130	25
Lighter ..	"	—	"	40	—
Lighter ..	"	—	"	30	—
Barge ..	"	—	"	20	—
Cumberland ..	Iron	—	"	120	—
* Ferry Boat ..	Steel	Steam	Foreign	50	25
Launch ..	"	"	"	8	—
* President Carnot ..	Iron	"	"	400	60

\* Compound.

† Triple.

By THE TYNE IRON SHIPBUILDING Co., Limited, Willington Quay, Newcastle-on-Tyne.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Dora Forster ..	Steel	Steam	British	2,409	225
† Cape Coluna ..	"	"	"	2,707	250
† Vesta ..	"	"	Foreign	1,052	100
† Mersario ..	"	"	British	1,486	140
† Ceres ..	"	"	Foreign	1,056	100
† Etherley ..	"	"	British	1,755	165
† Tresco ..	"	"	"	2,532	225
† Strathdee ..	"	"	"	2,600	225

By JOS. L. THOMPSON & SONS, North Sands, Sunderland.

† Jordan ..	Steel	Steam	British	2,071	250
† Whitby ..	"	"	"	2,081	180
† Cambria ..	"	"	"	1,957	180
† White Jacket ..	"	"	"	2,172	200
† Dunale ..	"	"	"	2,022	180
† Ethelreda ..	"	"	"	2,159	220
† Gloucester City ..	"	"	"	2,193	220
† Roma ..	"	"	"	2,606	230
† Avonmore ..	"	"	"	2,511	250
† Joannis Millas ..	"	"	Greek	2,071	200
† Culgoa ..	"	"	British	3,400	500
† Caledonia ..	"	"	"	2,650	230
† Parkfield ..	"	"	"	2,650	230

By WM. WHITE & SONS, West Cowes, Isle of Wight.

† Fern ..	Composite	Steam	British	64	6
† Daisy ..	Steel	"	Foreign	75	26
† Rose ..	Wood	"	British	20	4
† Drina ..	"	Sail	"	13	—
† Mimosa ..	"	"	"	26	—

By EDWD. WITBY & Co., West Hartlepool.

† Wastwater ..	Steel	Steam	British	2,810	250
† Khio ..	"	"	"	2,376	220
† Daventry ..	"	"	"	2,455	200
† Haldon ..	"	"	"	1,519	140
† Dalmally ..	"	"	"	2,472	180
† Staffa ..	"	"	"	2,080	220
† Rothfield ..	"	"	"	2,331	250
† Verax ..	"	"	"	2,472	180
† Sandfield ..	"	"	"	2,000	200

By RAYLTON, DIXON & Co., Middlesborough-on-Tees.

† Aslaoce ..	Steel	Steam	British	2,524	220
† Ethiopie ..	"	"	"	2,392	220
† Delmar ..	"	"	"	2,323	220
† Elba ..	"	"	"	2,293	220
† Cottingham ..	"	"	"	2,354	220
† Ironopolis ..	"	"	"	2,360	200
† Daylight ..	"	"	"	2,338	200
† Hibernia ..	"	"	"	2,371	220
† Syria ..	Iron	"	"	2,168	190
† Indiana ..	"	"	"	2,167	190
† G. R. Booth ..	Steel	"	"	2,454	200
† Orion ..	"	"	"	3,242	300
† Ivy ..	"	"	"	1,215	100
† Tunbridge ..	"	"	"	2,380	225
† Ovingdean Grange ..	"	"	"	2,433	250
† Bona ..	"	"	"	2,380	200
† Paranagua ..	"	"	Foreign	2,000	250
† Screw Steamer ..	"	"	"	795	110

By ROPNER & SON, Stockton-on-Tees.

† Ataka ..	Steel	Steam	British	3,650	495
† Maltby ..	"	"	"	2,752	280
† Thornaby ..	"	"	"	1,730	160
† Sarah Radcliffe ..	"	"	"	2,163	160
† Aislaby ..	"	"	"	2,745	280
† Tynedale ..	"	"	"	2,148	160
† Aurora ..	"	"	"	2,740	220
† Ackworth ..	"	"	"	2,150	200
† Romola ..	"	"	"	2,142	200
† Raisby ..	"	"	"	2,204	200
† Eon ..	"	"	"	2,202	200
† Ormesby ..	"	"	"	2,810	280

\* Compound.

† Triple.

By THE BLYTH SHIPBUILDING Co., Limited, Blyth.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
Peace ..	Steel	Steam	British	1,696	160
Petunia ..	"	"	"	1,691	160
Crown ..	"	"	"	1,659	160
Crimea ..	Iron	"	"	1,664	160
King Alfred ..	Steel	"	"	1,189	100
Corennie ..	Iron	"	"	624	80
Krim ..	Steel	"	Foreign	1,728	160
Sirius ..	Iron	"	British	638	70

By HARVEY & Co. Limited, Hale.

† Lyonesse ..	Steel	Steam	British	329-26	140
† Advance ..	Iron	"	"	153-78	—
† Tongahau ..	Steel	"	"	1,816-82	200

By W. GRAY & Co., West Hartlepool.

† Ariel ..	Steel	Steam	British	2,884-12	220
† Norlands ..	"	"	"	1,773-96	150
† Clio ..	"	"	"	2,696-75	220
† Falka ..	"	"	"	1,786-81	150
† Duchess Cornwall ..	"	"	"	1,772-03	150
† Isleworth ..	"	"	"	2,648-41	250
† Thurston ..	"	"	"	1,921-11	160
† Mortlake ..	"	"	"	2,765-98	250
† Empress ..	"	"	"	1,029-86	300
† Theodorich ..	"	"	Foreign	1,595-03	150
† Geiseric ..	"	"	"	1,595-93	150
† Alarich ..	"	"	"	1,598-07	150
† Ermanarich ..	"	"	"	1,595-09	150
† Calliope ..	"	"	British	2,933-51	220
† Redcar ..	"	"	"	1,841-19	150
† Elmville ..	"	"	"	1,967-36	160
† Garlands ..	"	"	"	2,084-21	160
† Chingford ..	"	"	"	1,820-67	160
† Marmion ..	"	"	"	1,725-73	160
† Blackheath ..	"	"	"	2,570-85	250
† Romulus ..	"	"	Foreign	2,630-19	250
† Remus ..	"	"	"	2,634-64	250
† Iona ..	"	"	British	2,094-42	180
† Norsa ..	"	"	"	2,085-00	180
† Westbrook ..	"	"	"	1,680-58	150
† Cornubia ..	"	"	"	1,700-00	150
† Jno. Bright ..	"	"	"	2,650-00	220
† Eton ..	"	"	"	2,650-00	220

By T. R. OSWALD & Co., Limited, Milford Haven Shipbuilding and Engineering Works, Milford Haven.

† Dieppois ..	Steel	Steam	Foreign	1,250	150
* Najade ..	Iron	"	"	152	80

By JOHN PRIESTMAN & Co., Southwick, Sunderland.

† Glencairn ..	Steel	Steam	British	1,136	110
† Deddington ..	"	"	"	2,144	200
† Elena Cosulich ..	"	"	Foreign	1,197	110
† Cheriton ..	"	"	British	1,180	120
† May ..	"	"	"	1,180	120
† Charles Steels ..	"	"	"	1,200	120

By T. & W. SMITH, North Shields.

† Antoinette ..	Steel	Steam	Foreign	738	80
† Isle of Iona ..	Iron	"	British	1,168	98
† Stanwick ..	"	"	"	1,141	98
† Isle of Jura ..	Steel	"	"	1,014	90
† Rondo ..	"	"	"	1,158	98
† Yordenskjold ..	"	"	Foreign	1,182	100
† Skotland ..	"	"	"	700	75

By ROBERT THOMPSON & SONS, Southwick Yard, Sunderland.

† Wild Flower ..	Steel	Steam	British	2,656-55	250
† Urbino ..	"	"	"	2,350-67	200
* Hazelmere ..	Iron	"	"	1,200-92	120
† Southery ..	Steel	"	"	2,067-61	180
† Inchmarlo ..	"	"	"	2,966-81	300
† Iona ..	"	"	"	1,661-44	150
† Palentino ..	"	"	Foreign	2,406-86	250
† Drummond ..	"	"	British	2,364	250

\* Compound.

† Triple.

‡ Single.

## By BARTRAM, HASWELL &amp; Co., South Dock, Sunderland.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Edenmore ..	Steel	Steam	British	2,459	250
† Hazel Branch ..	"	"	"	2,573	300
† Lochmore ..	"	"	"	2,461	250
† Rubinstein ..	"	"	"	2,464	250
† Craigmores ..	"	"	"	1,960	220

## By RICHARDSON, DUCK &amp; Co., South Stockton Iron Works, Stockton-on-Tees.

Chili ..	Steel	Steam	Foreign	2,979	340
Moonstone ..	Iron	"	British	2,076	200
Douro ..	Steel	"	"	2,382	200
Ebro ..	"	"	"	2,413	200
Meggie ..	Iron	"	"	1,746	190
Ulidia ..	"	Sail	"	2,405	—
Tuskar ..	Steel	Steam	"	2,389	200
Sheerness ..	Iron	"	"	2,130	200
Beatrice ..	Steel	"	"	660	99
Scottish Moors ..	Iron	Sail	"	2,405	—

## By Jos. T. ELTRINGHAM &amp; Co., Stone Quay, South Shields.

Flying Elf ..	Iron	Steam	British	131-33	80
Flying Sprite ..	"	"	"	130-23	80
* Chancellor ..	"	"	"	78-52	27
† Euxine ..	Steel	"	Foreign	170-37	70
Salt ..	"	"	British	113-90	75
Steel ..	"	"	"	110-00	75
Iron ..	"	"	"	110-00	75
* Royal Prince ..	Iron	"	"	108-19	40

## By EDWARD FINCH &amp; Co., Chepstow.

† Dove ..	Steel	Steam	Foreign	487	—
* Windsor (tug) ..	Iron	"	British	—	—
126 (fire-boat) ..	Steel	"	"	—	—

12 lighters for the Admiralty, 150 tons each.

## By STRAND SHIPYARD Co., Sunderland.

† Athalie ..	Steel	Steam	Foreign	2,158	180
† Washington ..	"	"	British	1,194	130
† Eva ..	"	"	"	1,276	130
† Specialist ..	"	"	"	2,853	230

## By WATKINS &amp; Co., Blackwall.

† Nimble ..	Wood	Steam	British	15	10
† Scout ..	"	"	"	15	10
† Nora ..	"	"	"	25	18
* Humber ..	"	"	"	35	25
* Colono ..	"	"	Foreign	15	10

## By H. FELLOWS &amp; Co., Yarmouth.

Albert ..	Wood	Sail	British	154	—
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## By CAMNER &amp; NICHOLSON, Gosport.

† Euphrosyne ..	Wood	Steam	British	141-50	56
Woodcock ..	"	Sail	"	14	—

## By CHARLES HILL &amp; SONS, Albion Dockyard, Bristol.

Sita ..	Steel	Sail	British	—	—
Nellie Troop ..	"	"	"	1367-35	—

## By W. SHILTON, Plymouth.

Western Belle ..	Wood	Sail	British	154	—
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## By FORRETT &amp; SON, Norway Yard, Limehouse.

* Launch ..	Wood	Steam	British	4	2
" ..	"	"	"	4	2
" ..	"	"	"	5	1½
" ..	"	"	Foreign	—	—
" ..	"	"	British	5	—
† Admiralty Launch ..	Composite	"	"	21	—
† " ..	"	"	"	21	—
† " ..	"	"	"	18	—
" Life Cutter ..	Wood	"	"	5	—
" ..	"	"	"	5	—
" ..	"	"	"	5	—
" Barge ..	"	Sail	"	—	—
4 Lifeboats ..	"	"	"	—	—

\* Compound. † Triple. ‡ High Pressure.

## By FAY &amp; Co., Southampton.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
Falkyrie ..	Steel	Sail	British	56-76	—
Lethe ..	"	"	"	112	—

## By FORRETT &amp; SON, Wyvenhoe, Essex.

Lady Hermione ..	Composite	Sail	British	4½	—
Sir Staff. Northcote ..	Wood	"	"	100	—
Wyvenhoe ..	Steel	Steam	Foreign	5½	—
Luzia ..	"	Pad'le	"	6½	—
Life Boat ..	Wood	"	British	—	—
" ..	"	"	"	—	—
Whale Boat ..	Steel	"	Foreign	—	—
Maria ..	Galv. Steel	Steam	"	22	—
Lighter ..	Wood	"	"	—	—
Pioneer ..	Galv. Steel	Pad'le	"	16½	—
Barge ..	Iron	"	"	26	—
Launch ..	Wood	Screw	"	—	—
5 Centre Board Boats ..	—	—	—	—	—

## By VOSPER &amp; Co., Portsmouth.

* Hercules ..	Steel	Steam	British	55-46	45
* Steam Life Cutter ..	Wood	"	"	5-00	5
" ..	"	"	"	5-00	5
" ..	"	"	"	5-00	5
† Adolpho Henriksen ..	"	"	"	3-00	3

## By COOK, WELTON &amp; GEMMELL, South Bridge Road, Hull.

Nil Desperandum ..	Iron	Steam	British	140	45
Excelsior ..	"	"	"	140	45
Philip Moxled ..	"	"	"	140	45
Edward Robson ..	"	"	"	140	45
Torfrida ..	"	"	"	136	80
Undine ..	"	"	"	168	50
Foxhound ..	"	"	"	140	45
Deerhound ..	"	"	"	140	45
Ostrich ..	"	"	"	140	45
Graphio ..	"	"	"	145	45
Greyhound ..	"	"	"	140	45
Englishman ..	"	"	"	169	80

## By SHORT BROTHERS, Sunderland.

† John Sanderson ..	Steel	Steam	British	3,268	300
† Magnus Mail ..	"	"	"	2,251	200
† City of Belfast ..	"	"	"	2,236	180
† Moorish Prince ..	"	"	"	2,261	200
† Thomas Anderson ..	"	"	"	2,533	200
† Mittelweg ..	Iron	"	Foreign	1,264	160
† Florence ..	Steel	"	British	2,493	200
Arabian Prince ..	"	"	"	2,265	200
Regina ..	"	"	"	2,638	200
† Grecian Prince ..	"	"	"	2,220	200

## By RUTHERFORD &amp; Co., Birkenhead.

* Sutton Badshaw ..	Wood	Steam	Foreign	45	20
* Tagus ..	"	"	"	20	10
Amy ..	"	"	British	4	6
† 714 ..	"	"	Foreign	6	6
† 715 ..	"	"	British	3	4

## By MILLER, TUPP &amp; ROUSE, Lower Mall, Hammersmith.

† Wizard ..	Composite	Steam	Foreign	4	6
† Cuckoo ..	"	"	"	3	3
† Edith ..	Wood	"	British	3	3
† Brenhelda ..	"	"	"	3	3
† Tiger ..	Steel	"	Foreign	14	12
† Marmoset ..	Wood	"	"	2	2

## By SAMUDA BROTHERS, Limited, Poplar, E.

* Florence ..	Steel	Steam	Foreign	25½ o.m.	52
The Shah ..	"	"	"	—	—
H. M. Stanley ..	"	"	British	150½ o.m.	140
Kaiser ..	"	"	"	—	—
Dk. of Cambridge ..	"	"	"	—	—
* Ben ..	"	"	"	63½ o.m.	225
New Passenger vessel for Turkish Government ..	"	"	Foreign	429½ o.m.	550

\* Compound. † High Pressure.

By R. LEVY &amp; Co., West Hartlepool.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Reggio .. ..	Steel	Steam	British	1,218	96
† Marian .. ..	"	"	"	1,926	150
† Lillian .. ..	"	"	"	1,219	96
* Despina G. ..	"	"	"	"	"
Michalino .. ..	Iron	Steam	Foreign	1,763	140

By W. H. POTTER &amp; SONS, Queen's Dock, Liverpool.

Alcyone .. ..	Iron	Sail	Foreign	2,219	—
Sierra Vultana ..	Steel	"	British	1,853	—
Falkland .. ..	Iron	"	"	2,804	—
No. 1 .. ..	"	"	"	274	—
No. 2 .. ..	"	"	"	274	—
No. 3 .. ..	"	"	"	274	—

By LAIRD BROS., Birkenhead.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Columbia .. ..	Steel	Steam	Foreign	7,363	13,500
† Cambria .. ..	"	"	British	310	1,100
† Lynx .. ..	"	"	"	596	1,650
† Antelope .. ..	"	"	"	596	1,650
† Gazelle .. ..	"	"	"	596	1,650
† Russia .. ..	"	"	Foreign	4,017	3,500

By JAMES LAING, Deptford Yard, Sunderland.

Ben Corlio .. ..	Steel	Steam	British	2,061	1,000
Mombassa .. ..	"	"	"	4,662	3,500
† Wychwood .. ..	Iron	Sail	"	1,273	—
† Galicia .. ..	Steel	Steam	Foreign	2,854	1,800
† Olympo .. ..	"	"	British	2,164	1,400
† St. Marnock ..	"	"	"	2,969	1,800
† Clifton .. ..	"	"	"	2,101	1,000
† Umvolosy .. ..	Ir'n & steel	"	"	1,776	1,200
† Glenartney ..	Steel	"	"	3,100	2,400
† Ville du Havre ..	"	"	Foreign	3,100	2,000
Norse King .. ..	"	"	British	3,100	2,400

By ROBERT STEPHENSON &amp; Co., Hebburn, Newcastle-on-Tyne.

† Pocahontas .. ..	Steel	Steam	British	2,627	1,400
† Pocasset .. ..	"	"	"	2,627	1,400
† Kolpino .. ..	"	"	"	2,306	1,100
† Durham .. ..	"	"	"	3,234	1,700
† Westhall .. ..	"	"	"	2,800	1,200
† Matatua .. ..	"	"	"	3,321	1,700
† Morella .. ..	"	"	"	3,602	1,700

By WM. DOBSON &amp; Co., Low Walker, Newcastle-on-Tyne.

† Cape Clear .. ..	Steel	Steam	British	1,772	900
† Arndilly .. ..	"	"	"	1,522	800
† Talavera .. ..	"	"	"	1,772	900
† Saragossa .. ..	"	"	"	1,790	900
† Eiffel Tower ..	"	"	"	3,085	1,350
† Antiquary .. ..	"	"	"	1,030	600
† England .. ..	"	"	Foreign	810	480
† Beberibo .. ..	"	"	"	720	800

By Cox &amp; Co., Falmouth.

† Narciso Deulofeu ..	Steel	Steam	Foreign	160	460
" .. ..	"	"	"	60	160
* Busy Bee (yacht) ..	"	"	British	25	90

By WIGHAM, RICHARDSON &amp; Co., Newcastle-on-Tyne.

† Sikh .. ..	Steel	Steam	British	2,672	2,500
† Città di Genova ..	"	"	Foreign	1,917	2,600
† Félix Touache ..	"	"	"	1,411	1,750
† Rhône .. ..	"	"	"	1,413	1,750
† Aquila .. ..	"	"	"	2,542	5,600
† Bungaree .. ..	"	"	British	2,893	2,300
† Fonar .. ..	"	"	"	3,014	1,650
† Hornby Grange ..	"	"	"	2,524	1,300
† Lyseemoon .. ..	"	"	Foreign	1,911	1,300
No. 245 .. ..	"	Sail	"	55	—
† Port Caroline ..	Engined	only, hulls by other			3,900
† Strathdee .. ..	builders.				1,300

\* Compound.

† Triple.

By C. S. SWAN &amp; HUNTER, Wallsend-on-Tyne.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Circassian Prince ..	Steel	Steam	British	2,243	1,050
† Deramore .. ..	"	"	"	2,283	1,250
† Aldersgate .. ..	"	"	"	2,271	1,100
† Newquay .. ..	"	"	"	2,062	1,150
† Santon .. ..	"	"	Colonial	2,504	1,200
† Cambridge .. ..	"	"	British	2,236	1,000
† Kara .. ..	"	"	"	2,338	1,200
† Lingfield .. ..	"	"	"	2,259	1,150
† Atturta .. ..	"	"	Italian	2,347	1,400
† Kriemhild .. ..	"	"	German	2,569	2,300
† Moldava .. ..	"	"	British	2,400	1,100
† Maori .. ..	"	"	"	2,800	1,750

By EARLE'S SHIPBUILDING &amp; ENGINEERING Co., Limited, Hull.

† Ambaca .. ..	Steel	Steam	Foreign	2,888	3,000
† Cazengo .. ..	"	"	"	2,888	3,000
† Blarney .. ..	Iron	"	British	1,158	1,600
† Juno .. ..	Steel	"	"	1,080	1,200
* Rugby .. ..	Iron	"	"	107	305
† Celtic .. ..	"	"	"	170	385
† Doric .. ..	"	"	"	170	385
† Polo .. ..	Steel	"	"	485	500
† Ariosto .. ..	"	"	"	2,100	2,400
† Sudero .. ..	Iron	"	"	170	430
† Sando .. ..	"	"	"	170	430
† Liberty .. ..	Steel	"	"	790	1,600
† No. 352 .. ..	Iron	"	"	170	430
† " 333 .. ..	"	"	"	170	430
† Brandon .. ..	"	"	"	718	1,000
† Benguella .. ..	"	"	Foreign	1,308	1,100
† Don .. ..	"	"	British	3,913	4,650

By SIR W. G. ARMSTRONG, MITCHELL &amp; Co., Newcastle-on-Tyne.

Italia .. ..	Steel	—	Foreign	3,498	2,160
Phosphor .. ..	"	—	British	2,023	1,000
H.M.S. Pandora ..	"	—	"	2,575	7,500
" Pelories .. ..	"	—	"	2,575	7,500
" Whiting .. ..	"	—	"	735	4,500
" Wizard .. ..	"	—	"	735	4,500
Lumen .. ..	"	—	"	2,357	1,350
Elise Marie .. ..	"	—	Foreign	3,194	1,600
Elberfeld .. ..	"	—	"	2,619	1,500
Barmen .. ..	"	—	"	2,614	1,500
Burg. Petersen ..	"	—	"	2,794	1,500
Kura .. ..	"	—	British	2,372	1,250
Itaparica .. ..	"	—	Foreign	2,544	1,850
Orange Prince ..	"	—	British	1,868	1,000
Ville de Douai ..	"	—	Foreign	1,914	1,000

By COCHRAN &amp; Co., Birkenhead.

† Explorer .. ..	Steel	St. w. l.	Foreign	30	15
* Beatrice .. ..	Wood	Steam	British	4	60
* Boxwell .. ..	Steel	"	Foreign	71	90
Barge .. ..	"	Sail	"	60	—
† Launch .. ..	Wood	Steam	"	7	15
* Santos .. ..	Steel	"	"	80	150
Four Barges .. ..	"	Sail	"	65	—
† Lindley .. ..	Wood	Steam	British	5	12
* Luna .. ..	Steel	T. S.	"	300	880
* Aquilon .. ..	Wood	Steam	Foreign	23	45
* Riociera .. ..	Steel	"	"	45	70
* Criado .. ..	"	"	"	88	80
† Uyara .. ..	"	"	"	20	40

Sundry lifeboats and other small boats, about 30 tons.

By THE NAVAL CONSTRUCTION &amp; ARMAMENTS Co., Limited, Barrow-in-Furness.

† Oraba .. ..	Steel	Steam	British	5,552	5,000
† Orotava .. ..	"	"	"	5,552	5,000
† Santiago .. ..	"	"	"	2,958	3,000
† Arequipa .. ..	"	"	"	2,953	3,000
† Barking .. ..	"	"	"	1,106	1,150
† Hilda .. ..	"	"	"	527	480
† Boma .. ..	"	"	"	2,509	1,200
† Matadi .. ..	"	"	"	2,509	1,200
† Soudan .. ..	"	"	"	2,509	1,200
† Ida .. ..	"	"	"	561	480

\* Compound.

† Triple.

‡ High Pressure.

By The SUNDERLAND SHIPBUILDING Co., Sunderland.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Gutenfels ..	Steel	Steam	Foreign	2,674	1,400
† Wittekind ..	"	"	"	1,047	450
† Carlisle ..	"	"	British	1,002	450
† Albion ..	"	"	Foreign	1,038	450
† Blairmount ..	"	"	British	1,439	720
† Rheinfels ..	"	"	Foreign	2,717	1,400
† Marobrunner ..	"	"	"	2,861	1,400
† Rüdeshheimer ..	"	"	"	2,848	1,400
† Raunenthaler ..	"	"	"	2,870	1,400
† Hochheimer ..	"	"	"	2,869	1,400
† Messapia ..	"	"	"	2,200	1,400

By R. &amp; W. HAWTHORN, LESLIE &amp; Co. Limited, Newcastle-on-Tyne.

Eagle ..	Steel	Steam	Foreign	4,500	10,000
Leny ..	"	"	British	2,385	1,300
Nairnshire ..	"	"	"	3,920	2,000
Desterro ..	"	"	Foreign	1,495	1,500
Porto Alegre ..	"	"	"	1,495	1,500
St. Clears ..	"	"	British	2,389	1,300
Blue Star ..	"	"	"	2,432	1,300
Morayshire ..	"	"	"	3,920	2,000

By WOOD, SKINNER &amp; Co., Bill Quay, Newcastle-on-Tyne.

† Transit ..	Steel	Steam	Foreign	1,334	750
† Skarpsno ..	"	"	"	1,816	1,000
† Activ ..	"	"	"	1,844	780
† Tonsberg ..	"	"	"	1,595	800
† Angelus ..	"	"	British	724	500
† Boldon ..	Iron	"	"	1,129	750
† Viceroy ..	Steel	"	"	950	500

By JOHN READHEAD &amp; SONS, South Shields.

† Demysios Stathatos ..	Steel	Steam	Foreign	1965-20	1069-98
† Trewellard ..	"	"	British	2218-90	1364-81
† Trevorian ..	"	"	"	2217-71	1365-49
† Holme Eden ..	"	"	"	2219-50	1361-57
† Dalegarth ..	"	"	"	2205-97	1216-66
† Aberfeldy ..	"	"	"	2226-96	1334-09
† Ainsdale ..	"	"	"	2186-10	1369-07
† Treglissan ..	"	"	"	2220-96	1364-02
† Camiola ..	"	"	"	2226-49	1382-08
† Moness ..	"	"	"	2235-73	1327-05
† Charters Tower ..	"	"	"	2278-53	1420-00
† Isle of Bardsey ..	"	"	"	1280-00	659-01

By PALMER'S SHIPBUILDING Co., Jarrow-on-Tyne.

Astral ..	Steel	Steam	British	2249-00	1,100
Cairntoul ..	"	"	"	1868-07	1,000
Redruth ..	"	"	"	2433-47	1,200
Emir ..	"	"	"	4027-27	2,200
Earnford ..	"	"	"	2208-95	1,400
Prudentia ..	"	"	"	2729-53	1,500
Beeswing ..	"	"	"	1924-03	1,200
Atalanta ..	"	"	"	1039-10	3,000
Kt. Templar ..	"	"	"	4188-00	2,600
Marpessa ..	"	"	"	1671-32	1,100
Planet ..	"	"	"	405-26	4,200
Wennington Hall ..	"	"	"	3886-74	1,500
Mary Thomas ..	"	"	"	2159-04	1,150
Eardale ..	"	"	"	2263-46	1,400
Lady Palmer ..	"	"	"	2752-50	1,300
Princess Sophia ..	"	"	Foreign	2293-17	1,250
Wansbeck ..	"	"	British	1669-27	900
Incharran ..	"	"	"	2856-17	1,520
County ..	"	"	"	2043-79	1,200
Rsqn ..	"	"	"	2186-36	1,100
Alderley ..	"	"	"	3042-00	1,500
Egremont Castle ..	"	"	"	2887-00	1,500
Lady Tennant ..	"	"	"	2090-00	1,200
Ringwood ..	"	"	"	904-99	900
Edenbridge ..	"	"	"	2470-00	1,300
La Campine ..	"	"	Foreign	2588-00	1,200
A. Baassounaou ..	"	"	"	2563-00	1,250
Westhall ..	"	"	British	2470-00	1,300

Also 2 sets Government Engines, 3,000-1 h.p. each.

\* Compound.

† Triple.

## SCOTCH.

By WILLIAM SWAN &amp; Co., Maryhill, N.B.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† No. 133 ..	Iron	Steam	British	60	20
„ 134 ..	Steel	"	Foreign	80	—

By SCOTT &amp; Co., Bowling, Glasgow.

† Saint Margaret ..	Steel	Steam	British	450	80
† Saint Kilda ..	"	"	"	451	80
† Nugget ..	Iron & steel	"	"	369	60
† Garnet ..	"	"	"	392	60
† Sard ..	"	"	"	392	60

By A. HALL &amp; Co, Footdee, Aberdeen.

Inverurie ..	Steel	Sail	British	1,373	—
* Pioneer ..	"	Steam	"	90	30
* James Hunter ..	"	"	"	215	50
* St. Flotin ..	Iron	"	"	142	60
† Bonaccord ..	Steel	"	"	1,500	200

By ROBERT DUNCAN &amp; Co., Port Glasgow.

Enterkin ..	Steel	Ship	British	1698-10	—
Brunel ..	"	"	"	1636-72	—
Craigerne ..	"	"	"	1822-41	—
Dalswinton ..	"	"	"	1627-76	—
† Holyrood ..	"	Screw	"	2711-76	167
† Baron Fife ..	"	"	"	1330-0	100
† Barge ..	"	T. S.	"	430-0	46

By HALL, RUSSELL &amp; Co., Aberdeen.

† Alford ..	Steel	S. S.	British	1900	220
† Yuen Sang ..	"	"	"	1800	220
† Ifafa ..	"	"	"	1810	240
* North Cape ..	"	"	"	180	50
* North Pole ..	"	"	"	180	50

By WILLIAM HAMILTON &amp; Co., Port Glasgow.

† Franklin ..	Steel	Steam	British	1800	127
† King Robert ..	"	Sail	"	1705	—
† Grace Harwar ..	"	"	"	1807	—

By ALEXANDER STEPHEN &amp; SON, Dundee.

North Carr ..	Wood	L. S.	British	163	—
Newfield ..	Steel	Sail	"	1345	—

By BIRRELL, STENHOUSE &amp; Co., Dumbarton.

Elginshire ..	Steel	Sail	British	2160	—
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By DAVID MACGILL &amp; Co., Irvine.

* W. E. Gladstone ..	Steel	Steam	British	133	45
† Bee ..	"	"	"	133	45
* Z ..	"	"	"	60	20

By ANDROSSAN SHIPBUILDING Co., Ardrossan.

* Invicta ..	Steel	Steam	British	—	5
Flora ..	Wood	Sail	"	18	—

By D. M. CUMMING, Blackhill Dock, Glasgow.

† No. 10 fore & aft ..	Steel	Steam	British	14	8
† Ines ..	"	"	Foreign	10	2
† Emilio ..	"	"	"	10	2

By RAMAGE &amp; FERGUSON, Leith.

† Suffolk ..	Steel	Steam	British	3303-41	230
† Rosary ..	"	"	"	1112-57	150
† Realm ..	"	"	"	1663-91	180
† Rex ..	"	"	"	1665-20	189
† Barraclough ..	"	"	"	1783-52	160
† Semiramis ..	"	"	"	703 ym	120
† Caisson ..	Iron	"	Foreign	60 BK	—
† Zamora ..	Steel	"	British	1245-01	137
† Yeimar ..	"	"	"	1500-00	247

By JAMES &amp; GEORGE THOMSON, Clyde Bank, Glasgow.

† Friesland ..	Steel	Steam	Foreign	7,116	5,000
† Phoenix ..	"	"	British	2,600d	7,500
† Psyche ..	"	"	"	2,600d	7,500

\* Compound.

† Triple.

‡ High Pressure.

## By HAWTHORN &amp; Co., Leith.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
* 73 .. .. .	Steel	Steam	British	340	350
* 74 .. .. .	"	"	"	340	250

## By RUSSELL &amp; Co., Port Glasgow and Greenock.

Dunkerque .. .. .	"	Sail	Foreign	3,153	—
Peter Rickmers .. .. .	"	"	"	2,958	—
Sir Robert Fernie .. .. .	"	"	British	2,648	—
Glencaird .. .. .	"	"	"	2,618	—
Cairnhiill .. .. .	"	"	"	2,648	—
Dumfriesshire .. .. .	"	"	"	2,650	—
Craigend .. .. .	"	"	"	2,272	—
Stanley .. .. .	"	"	"	2,210	—
Port Douglas .. .. .	"	"	"	1,717	—
Port Patrick .. .. .	"	"	"	1,758	—
Glenmark .. .. .	"	"	"	1,352	—
Glenesk .. .. .	"	"	"	1,352	—
Hawthornbank .. .. .	"	"	"	1,369	—
J. H. Hustede .. .. .	"	Foreign	"	1,143	—
Helene Rickmers .. .. .	"	Steam	"	3,132	—
Sophie Rickmers .. .. .	"	"	"	3,123	—
Latona .. .. .	"	"	British	3,050	—
Larnaca .. .. .	"	"	"	2,387	—
Strath Lyon .. .. .	"	"	"	2,340	—
Strathendrick .. .. .	"	"	"	2,335	—
Conqueror .. .. .	"	"	"	386	—

## By CHARLES CONNELL &amp; Co., Whiteinch, Glasgow.

† Dryfesdale .. .. .	Steel	Steam	British	3,407	280
† Summerfeld .. .. .	"	"	Foreign	2,625	350
† Capella .. .. .	"	"	British	3,220	400
† Orient .. .. .	"	Sail	Foreign	1,663	—
Occident .. .. .	"	"	"	1,663	—
Arethurn .. .. .	"	"	"	1,782	—
Hazelbank .. .. .	"	"	British	1,660	—

## By S. M'KNIGHT &amp; Co., Ayr.

† Lord Aberdeen .. .. .	Steel	Screw	British	1,400	171
† Eden Vale .. .. .	"	"	"	488	80
† Gascony .. .. .	"	"	"	1,200	150
† Guienne .. .. .	"	"	"	1,200	150
* Flying Vulture .. .. .	"	T. S.	"	270	98

## By CAIRD &amp; Co., Greenock.

Bombay .. .. .	Steel	Steam	—	3,168	450
Hong Kong .. .. .	"	"	—	3,174	450
Shanghai .. .. .	"	"	—	3,171	450
Canton .. .. .	"	"	—	3,171	450
Galatea .. .. .	"	"	—	331	250
Portia .. .. .	"	"	—	246	120
Rydal Hall .. .. .	"	"	—	3,200	450

## By A. &amp; J. INGLIS, Pointhouse, Glasgow.

† Darthula .. .. .	Composite	Yacht	British	10	—
† Bayonne .. .. .	Steel	Steam	"	3,294	250
— .. .. .	"	"	"	5,000	700

## By W. B. THOMPSON &amp; Co., Limited, Dundee.

† Pladda .. .. .	Iron	Steam	British	1,102	280
† Ailsa Craig .. .. .	Steel	"	"	3,380	350
† Arrow .. .. .	"	"	"	122	70
† Red Sea .. .. .	"	"	"	1,929	240
† Guide .. .. .	Iron	"	"	817	440
† Egret .. .. .	Steel	"	"	1,120	200

## By LONDON &amp; GLASGOW SHIPBUILDING Co., Govan, Glasgow.

† Indramayo .. .. .	Steel	Steam	British	4,110	450
† Baroda .. .. .	"	"	Foreign	2,900	400
† Kweiyang .. .. .	"	"	British	1,650	240

## By ARCHD. McMILLAN &amp; SON, Dockyard, Dumbarton.

Notafeld .. .. .	Iron	Sail	Foreign	1,894	—
Kinloch .. .. .	Steel	Steam	British	1,827	—
Bawnmore .. .. .	"	"	"	2,196	—
Kelga .. .. .	"	Sail	Foreign	1,727	—
Bridgewater .. .. .	"	Steam	"	208	—
Spindrift .. .. .	"	"	British	708	—
Queen Elizabeth .. .. .	"	Sail	"	1,784	—

\* Compound.

† Triple.

## By GOURLAY BROS. &amp; Co., Dundee.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H. P. N.
Dean .. .. .	Steel	Steam	British	1,476	180
Oceana .. .. .	Iron	Screw	"	311	160
Loch Katrine .. .. .	Steel	Steam	"	1,476	180
Burrawong .. .. .	"	Screw	Foreign	391	70
Queensmore .. .. .	"	Steam	British	3,800	500
Heron .. .. .	Iron	Steam	"	879	150

## By JOHN SCOTT &amp; Co., Kinghorn, Fifeshire.

* Scottish Maid .. .. .	Iron	Screw	British	121-55	50
* Laverock .. .. .	Steel	Pad'le	"	54-49	250
* Philomel .. .. .	"	"	"	661-61	350
† Scottish Queen .. .. .	"	Screw	"	125-50	50
† Abbotshall .. .. .	"	"	"	460-00	95
* William Yale .. .. .	"	"	"	75-00	25
Barge .. .. .	"	Sail'g	Foreign	36-00	—
Barge .. .. .	"	"	"	36-00	—

## By MACKIE &amp; THOMSON, Govan, Glasgow.

† Silver King .. .. .	Iron	Steam	British	131	325
† Golden Hope .. .. .	"	"	"	131	325
† Capricornus .. .. .	"	"	"	165	325
† Aquarius .. .. .	"	"	"	165	325
† Samara .. .. .	Steel	"	"	1,623	900

## By ALEX. STEPHEN &amp; SONS, Linthouse, Glasgow.

Can Roch .. .. .	Steel	Sail	British	1,657	—
† Strathclyde .. .. .	"	Steam	"	3,423	360
† Capua .. .. .	"	"	Foreign	2,112	210
† Nyassa .. .. .	"	"	British	2,312	210
† Salenio .. .. .	"	"	Foreign	2,127	210
† Mangara .. .. .	"	"	British	1,874	170
† Carradale .. .. .	"	Sail	"	2,085	—
† Chemnitz .. .. .	"	Steam	Foreign	2,835	300

## By ROBERT M'ALLISTER, Dumbarton.

* Rose .. .. .	Wood	Steam	British	9	30
† Ulada .. .. .	"	"	"	20	70
— .. .. .	"	"	"	12	30
— .. .. .	"	"	"	30	—
Thistle .. .. .	"	Sail	"	4	—
Garnette .. .. .	"	"	"	24	—
— .. .. .	"	"	"	24	—

## Several centre board boats (British).

## By BLACKWOOD &amp; GORDON, Port-Glasgow.

† Marliposa .. .. .	—	—	British	400	—
† Langosta .. .. .	—	—	"	400	—

## By JAMES ADAM, Gourrock.

Loosestrife .. .. .	Wood	Elect.	British	15	—
Queen Mab .. .. .	"	Sail	"	5	—

## By the CAMPBELTOWN SHIPBUILDING Co., Campbeltown.

† Merquedex .. .. .	Iron	Steam	Foreign	867	90
† Craiglee .. .. .	Steel	"	British	1,986	160
† Torgorm .. .. .	"	"	"	1,613	150

## By AITKEN &amp; MANSEL, Whiteinch, Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Tabor .. .. .	Steel	Steam	British	2,500	1,300
† Anubis .. .. .	"	"	"	2,500	1,300
† Mira .. .. .	"	"	"	3,140	1,600

## By W. SIMONS &amp; Co., Renfrew.

* Beaver .. .. .	Steel	Steam	Colonial	550	500
* St. Andrew .. .. .	"	"	British	550	700
† Hopper Dredger .. .. .	Iron	"	"	300	300
* Francis Henty .. .. .	"	"	Colonial	600	550
* G. Ward Cole .. .. .	"	"	"	600	550
* Dredger .. .. .	"	"	Foreign	150	200
Hopper Barge .. .. .	"	Sail	"	75	—
" .. .. .	"	"	"	75	—
" .. .. .	"	"	"	75	—
† Alexandria .. .. .	"	Steam	British	400	300

\* Compound.

† Triple.

## By MURDOCH &amp; MURRAY, Port Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Baron Elibank ..	Steel	Steam	British	1,772	900
† Rannoch .. ..	"	"	"	1,812	900
† Bavaria .. ..	"	"	"	1,685	1,100

## By the AILSA SHIPBUILDING Co., Troon, N.B.

§ A. F. Braga ..	Steel	Steam	Foreign	400	500
§ Monte Video ..	"	"	"	736	1,000
§ Salto .. ..	"	"	"	260	300
† Kaviana .. ..	"	"	British	1,125	1,800
† Aska .. ..	"	"	"	430	900
† Juba .. ..	"	"	"	430	900
† Paragon .. ..	"	"	"	390	520

## D. &amp; W. HENDERSON &amp; Co., Meadowside, Partick, Glasgow.

† Lord Stanley ..	Steel	T. S.	Foreign	276	850
† Scotia .. ..	"	Steam	British	2,850	1,950
† Bellova .. ..	"	"	"	2,548	1,475
† Bellanoch .. ..	"	"	"	2,548	1,475
† Santanderino ..	"	"	Foreign	3,140	2,500
12 barges .. ..	Composite	Sail	"	444	—

## By LOBNITZ &amp; Co., Renfrew, N.B.

* Steam Launch ..	Steel	Steam	Foreign	86	50
* Auxiliat III. ..	"	"	"	56	100
* Marita .. ..	"	"	British	78	150
* Marie .. ..	"	"	Foreign	33	50
† Gorm .. ..	"	"	"	1,583	1,000
† Sendai Maru ..	"	"	"	1,600	1,200
† Musashi Maru ..	"	"	"	2,348	2,000
† Nidaros .. ..	"	"	"	778	900

## By THE GRANGEMOUTH DOCKYARD Co., Grangemouth.

† Porro .. ..	Steel	Steam	Foreign	601	400
† Banks Peninsula ..	"	"	British	271	400
† Adinnie .. ..	"	"	"	1,832	1,100
† Twilight .. ..	"	"	"	1,606	900
† Empress .. ..	"	"	"	1,314	850
† Godolphin .. ..	"	"	"	1,611	900
† Scotland .. ..	"	"	Foreign	885	700
† Moray .. ..	"	"	British	818	400
† Bankholme .. ..	"	Sail	"	1,229	BK
† Jaederen .. ..	"	Steam	Foreign	464	800
† Siam .. ..	"	Sail	"	750	BK
† Edith .. ..	"	Steam	British	1,740	1,000
† And .. ..	"	"	Foreign	906	500
† Mexico .. ..	"	"	"	520	600

## By NAPIER, SHANKS &amp; BELL, Yoker, Glasgow.

Tamar .. ..	Steel	Sail/g	British	2,115	—
† Modjeska .. ..	"	T. S.	Canadn.	455	1,600
† Hsin Yu .. ..	"	Screw	Foreign	1,378	1,450
† Rajah Brooks ..	"	"	British	1,218	900

## By JOHN FULLERTON &amp; Co., Paisley.

* Amy .. ..	Iron	Steam	British	144-13	175
† Emerald .. ..	"	"	"	400-54	400
† Margaret .. ..	"	"	"	190-80	275
* Peridot .. ..	"	"	"	230-00	275

## By SCOTT &amp; Co., Cartdyke, Greenock.

H.M.S. Sparrow ..	Composite	G boat	—	805	1,200
H.M.S. Thrush ..	"	Dit to	—	805	1,200
Taikoo .. ..	Steel	—	—	536	—
Alexander III. ..	"	Steam	—	1,778	1,000
Calypeo .. ..	Iron	—	—	544	800
Tungue .. ..	Steel	"	—	1,096	1,200
Rei de Portugal ..	"	"	—	3,198	4,000
Loanda .. ..	"	"	—	3,199	4,000
Mocambique .. ..	"	"	—	3,199	4,000
Malange .. ..	"	"	—	3,548	4,000
Duchess of Albany	"	Pa'dle	—	256	800
Singan .. ..	"	Steam	—	1,666	1,000

## By R. NAPIER &amp; SONS, Lancefield, Glasgow.

Dora .. ..	Steel	Steam	British	740	2,500
Magdalena .. ..	"	"	"	5,300	7,000
Thames .. ..	"	"	"	5,600	7,000

\* Compound.

† Triple.

‡ Single.

## By DAVID J. DUNLOP &amp; Co., Inch Works, Port Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
Manhattan .. ..	Steel	Steam	British	3,500	1,800
Humber .. ..	"	"	"	950	1,300
Africa .. ..	"	Sch.	"	400	—
Nigretia .. ..	"	"	"	400	—
Ribago .. ..	"	Steam	"	450	500

## By FAIRFIELD SHIPBUILDING &amp; ENGINEERING Co., Limited, Govan Glasgow.

Munchen .. ..	Steel	Screw	Foreign	4,805	5,000
Cobra .. ..	"	Pad'le	British	847	4,850
China .. ..	"	Screw	Foreign	4,940	8,400
Calais Douvres ..	"	Pad'le	British	1,065	6,450
Karlruhe .. ..	"	Screw	Foreign	5,347	3,200
Stuttgart .. ..	"	"	"	5,366	3,200
Rameses the Great	"	Pad'le	British	970	350
Lady Torfrida ..	"	Screw	"	500	500

Also repairs and alterations to paddle steamers, *King Orry* and *Mona's Queen*.

## By SEATH &amp; Co., Rutherglen, Glasgow.

Steam Yacht ..	—	—	—	40	100
Steel Barge ..	—	—	Foreign	90	—
Steel Barge ..	—	—	"	90	—
Raven .. ..	—	Steam	British	200	57
Aires .. ..	—	"	"	100	70
Steel Barge ..	—	—	Foreign	90	—
Steel Barge ..	—	—	"	90	—

## By FLEMING &amp; FERGUSON, Paisley.

† Singapore .. ..	Steel	Steam	Foreign	1,500	1,800
† Valentino Alsina ..	Iron	"	British	600	800
† St. Fergus .. ..	Steel	"	"	520	500
† Dredger .. ..	"	"	"	500	500
† Dredger .. ..	"	"	"	500	500
10 sets of engines for steamers, "Sophia," "Carlotta," "Isobel," "Francisca," "Inez," "Maria," "Helena," "Juanita," "Theresa" and "Catarina." All patent quadruple expansion, indicating 450 h.p. each.					

## By J. M'ARTHUR &amp; Co., Abbotswich, Paisley.

* Jeurex Celman ..	Steel	—	Foreign	163	300
Edwards Wilde ..	"	—	"	163	300
— .. ..	"	—	"	54	70
Lady Gwendoline ..	Steel & iron	—	British	318	950
— .. ..	Steel	—	"	54	80

## By BARCLAY, CURLE &amp; Co., Whiteinch, Glasgow.

* Solent Queen ..	Steel	Pad'le	British	324	1,000
Glaucus .. ..	"	Sail	"	2,056	—
Janet Cowan .. ..	"	"	"	2,578	—
Brablock .. ..	"	"	"	2,062	—
Kilburn .. ..	"	"	"	2,578	—
Nord .. ..	"	"	Foreign	3,162	—

## By WM. DENNY &amp; Bros., Leven Shipyard, Dumbarton.

Montevideo .. ..	—	Steam	Foreign	5,096	5,000
Pegu .. ..	—	"	British	3,661	2,750
Aramac .. ..	—	"	Foreign	2,114	2,700
Arawatta .. ..	—	"	"	2,114	2,700
Megna .. ..	—	"	"	1,181	800
Dalhousie .. ..	—	"	"	741	2,550
Katorid .. ..	—	"	"	1,127	1,650
Monowai .. ..	—	"	"	3,500	2,700

In addition there was shipped in pieces, six flats, four steam launchers, and two steamers.

## By ALLEN &amp; MACLELLAN, Sentinel Works, Glasgow.

Perseverance ..	—	Screw	Foreign	44	40
40 pontoons ..	—	—	"	800	—
Henry Hammond ..	—	Steam	"	49	150
Guanaco .. ..	—	"	"	170	180
Lady Nayassa ..	—	"	"	22	—
3 dahabehas ..	—	"	"	58	—
Antonicia .. ..	—	Steam	"	9	50
3 barges .. ..	—	—	"	370	—
Tr. Ex. Engines ..	—	—	—	—	4,500
152 Aux. Engines	—	—	—	—	2,500

\* Compound.

† Triple.

By JOHN REID &amp; Co., Port-Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
Helopes .. ..	Steel	Screw	British	2,774	1,750
Hydarnes .. ..	"	"	"	2,774	1,750
Aameagna .. ..	"	"	Foreign	2,252	3,000
Caledonia .. ..	"	Pad'le	British	245	1,100
Irex .. ..	"	Sail	"	2,348	—
Puritan .. ..	"	"	Foreign	2,361	—

**IRISH.**

By CHARLES J. BIGGER, Londonderry, Ireland.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Brandenburg ..	Steel	Steam	British	1,568	1,300
County Antrim ..	"	Sail	"	1,240	—
Campbell .. ..	"	"	"	1,240	—
Lonsdale .. ..	"	"	"	1,756	—
Osseo .. ..	"	"	"	1,464	—

By WORKMAN, CLARK &amp; Co., Limited, Belfast.

† Star of England ..	Steel	Steam	British	3,511	400
† City of Vienna ..	"	"	"	4,470	700
† Hippomenes .. ..	"	"	"	2,694	400
† Dunmore Head ..	"	"	"	2,229	275
Iredale .. ..	"	Sail	"	1,574	—
† Uranus .. ..	"	Steam	Foreign	1,202	200
† County Down ..	"	"	British	2,030	186

By HARLAND &amp; WOLFF, Limited, Queen's Island, Belfast.

Name of Vessel.	Built of	Class.	Owners.	R.T. Regis.	H.P. I.
† Teutonic .. ..	Steel	Steam	British	9,685	16,000
† Majestic .. ..	"	"	"	9,685	16,000
† Runic .. ..	"	"	"	4,649	2,600
† British Empire ..	"	"	"	8,020	1,600
† Queensmore .. ..	"	"	"	4,195	2,300
† Lancashire .. ..	"	"	"	3,871	2,800
† Yorkshire .. ..	"	"	"	3,871	2,800
† Ameer .. ..	"	"	"	4,014	1,600
† Gaekwar .. ..	"	"	"	4,014	1,600
† Nawab .. ..	"	"	"	3,142	1,500
† Nadir .. ..	"	"	"	3,142	1,500
† Nizam .. ..	"	"	"	3,142	1,500

By M'ILLWAIN &amp; LEWIS, Limited, Belfast.

Topio .. ..	Iron	Steam	British	381	450
Bann .. ..	Steel	Sail	"	50	—
Foyle .. ..	"	"	"	50	—
Embiricos .. ..	"	Steam	Foreign	1,946	1,350
Adula .. ..	"	"	British	771	900
Mount Hebron ..	"	"	"	2,556	1,500
Alps .. ..	Re-boil'r'd & compnd.	"	"	1,608	1,000
Andes .. ..		"	"	1,601	1,000

**FRENCH.**

By LA CIE DES MESSAGERIES MARITIMES, La Ciotat.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Douro .. ..	Steel	Steam	French	2,700	350
† Mpanjaka .. ..	"	"	"	690	150
† Australien .. ..	"	"	"	6,500	1,000

By AUGUSTIN NORMAND &amp; Co., Le Havre.

Name of Vessel.	Built of	Class.	Owners.	R.T. Regis.	H.P. I.
* Torpedo Boat 126	Steel	—	French	80n	900
* " " 127	"	—	"	80n	900
* Do. " Avante Garde	"	—	"	120	1,000

\* Compound.

+ Triple.

By LA STE ANONYME DES CHANTIERES ET ANTELIERS DE LA GIRONDE, Bordeaux.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
* Salande .. ..	Steel	Steam	French	1,900	6,060
* Cosmao .. ..	"	"	"	1,900	6,060

By L'ANONYME DES CHANTIERES ET ANTELIERS DE LA LOIRE, St. Nazaire.

† Concordia .. ..	Steel	Steam	French	3,038	1,490
† Colonia .. ..	"	"	"	3,038	1,490
† Camparra .. ..	"	"	"	3,038	1,490
† Corricutes .. ..	"	"	"	3,038	1,490
† Hydra .. ..	"	"	"	4,800n	6,700

**DUTCH.**

By DE MAAS Co., Limited, Rotterdam.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Dolfyn .. ..	Steel	Steam	Dutch	186-53	75
† Ariel .. ..	"	"	"	688-92	80

By DE RONINKLYKE FABRIK VON STOOM-ENANDRE WERKUTINGEN, Amsterdam.

* Medan .. ..	Steel	Steam	Dutch	544	100
* J. Neinhuis .. ..	"	"	"	544	100
* Arvinge .. ..	"	"	"	220	80
† Poolster .. ..	"	"	"	60	50
† Reintz .. ..	Iron	"	"	1,009	130
† Prins Willem II...	Steel	"	"	1,700	210

By ROYAL SHIPBUILDING &amp; ENGINEERING Co., De Schelde, Flushing.

Pilot schooner, 10	Wood	Sail	Dutch	50	—
13	"	"	"	50	—
† Raaf .. ..	Composite	Steam	"	100	90
† Merapi .. ..	Steel	"	"	2,570	350
† Both .. ..	Iron	"	"	1,400	250

By NEDERLANDSCHE STOOMBOT MAATSCHAPPIJ, Rotterdam.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Prins Willem III.	Steel	Steam	Dutch	1,700	1,200

**ITALIAN.**

By POLI BROTHERS (Chioggia), Venice.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
Nuovo Pacifico ..	Wood	Sail	Italian	53	—
Guisceppina .. ..	"	"	"	53	—
Amedeo V. .. ..	"	"	"	53	—
Adria .. ..	Steel	Steam	"	—	16

**NORWAY.**

By THE LAXEVAAG'S SHIPBUILDING &amp; ENGINEERING Co., Bergen.

Name of Vessel.	Built of	Class.	Owners.	R.T. Regis.	H.P. N.
† Leif Eriksson ..	Steel & iron	Steam	Norwg'n	2,050	180
* Espana .. ..	Iron	"	"	500	70
† Hebe .. ..	Steel & iron	"	"	2,150	180

By AKERS MEKANISKA WERKSTUT, Aklv, Bolag, Christiansa.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Kong-Ragnar ..	Steel	Steam	Norwg'n	670	600
† Romsdal .. ..	"	"	"	111	220
† Rauma .. ..	"	"	"	120	145
† Indtronden .. ..	"	"	"	208	300

\* Compound.

+ Triple.

**SWEDEN.**

By LINDHOLMEN ENGINEERING &amp; SHIPBUILDING Co., Lindholmen.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
* Gota .. ..	Steel	Steam	Swedish	3070-00	800
† Blask .. ..	"	"	Foreign	2868-35	300
* Admiral .. ..	"	"	"	530-56	80
† Baron, Stjernblad ..	"	"	"	1000-00	130

By MOTALA MEKANISKA WERKSLAD A. B., Motala.

† Stella .. ..	Steel	Steam	Gothenberg	373	50
† Alma .. ..	"	"	"	375	50
* Lazar .. ..	"	"	Bacon	509	80
* Thor .. ..	"	"	Sundsvall	50	30
* Bolderan .. ..	"	Drtdgr	Riga	189	45
† Hebe .. ..	"	Steam	Gothenberg	373	50
† St. Alban .. ..	"	"	Odense	887	50
* Gold Kanal Y .. ..	"	"	Stockholm	186	30
* Lunn .. ..	"	"	Cronstad	120	60
* Mercur .. ..	"	"	"	103	60
* Gota .. ..	"	"	Sveruji	3070	800
† Blisk .. ..	"	"	Russia	2868	300
* Admiral .. ..	"	"	"	530	80
† Baron Scruble .. ..	"	"	Danish	1000	130
† Ruth .. ..	"	"	Gothenberg	374	50

**GERMAN.**

By SCHIFF UND MASCHINENBAU, ACTIEN GESELLSCHAFT, Germania, Kiel.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
* Holtenau .. ..	Steel	Steam	German	511b	140
* Brunsbüttel .. ..	"	"	"	511b	140
* Antigoni .. ..	Iron	Sail	"	1,490	—
* Merigan .. ..	"	"	"	1,490	—
* Anakonda .. ..	"	"	"	1,490	—
† Siegfried .. ..	Steel	Steam	—	3,800b	4,900
* Mellusa .. ..	"	Sail	German	7-5	—

By SCHIFFSWERFT VON HENRY KOCH, Lübeck.

† Ost .. ..	Steel	Steam	German	960	100
* Marga .. ..	"	Sail	"	1,073	—
* Luba .. ..	"	Steam	"	394	50
* Paula .. ..	"	"	"	614	90
† Kollund .. ..	"	"	"	1,000	100

By GEORGE HOWALDT, Kiel, since "Howaldtswerke."

* 4 pontoons .. ..	Iron	—	German	416-40	—
† Mimi .. ..	Steel	Steam	"	886-28	90
† Hinrich .. ..	"	"	"	926-92	100
† Moltke .. ..	"	"	"	946-42	90
† Michael Febsen .. ..	"	"	"	995-22	110
* Sperber .. ..	"	"	"	28-18	16
* Falke .. ..	"	"	"	28-50	16
* Geier .. ..	"	"	"	28-52	16
* Habicht .. ..	"	"	"	28-48	16
* Rudolf .. ..	"	"	"	285-95	40
† Holstein .. ..	"	"	"	1376-83	220
† Gaviota .. ..	"	"	Foreign	126-85	60
* Bahia Blanca .. ..	"	"	"	104-34	40
* Glondrina .. ..	"	"	"	103-81	40
† Alive .. ..	"	"	"	982-00	90
† Siegmund .. ..	"	"	German	982-00	90
* Martin .. ..	"	"	"	30-00	16

By ROSTOCKER ACTIEN GESELLSCHAFT, Rostock.

† Georg .. ..	Steel	Steam	German	963	400
† Adolf .. ..	"	"	"	965	400
* Lisbeth .. ..	Iron	"	"	695	350
* August Bröhan .. ..	"	S. T.	"	158	250
* Purvel .. ..	"	Barge	"	157	—
† Elita .. ..	Steel	Steam	"	735	350
† Marie Louise .. ..	"	"	"	746	350
* Selene .. ..	"	Barque	"	1,333	—
* Louis Krohn .. ..	"	Steam	"	621	300
* Rhombus .. ..	Iron	S. T.	"	160	250
* Senator Versmann ..	Steel	Ship	"	1,343	—
* Reiherstieg .. ..	"	Steam	"	50	120

\* Compound.

† Triple.

By GEBRÜDER SACHSENBERG, Rosslau, Elbe.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
* Pereinigte Schif. XI	Iron	Pad'le	German	320	480
* Freya .. ..	"	"	"	80	120
* Maiblume .. ..	"	"	"	60	90
* Kranich .. ..	Steel	Screw	"	310	320
* Speyer I. .. ..	Iron	"	"	110	200
* Sofia .. ..	Steel	"	Foreign	55	100
* Alfred .. ..	Iron	"	German	25	30
* Bremen No. 24 .. ..	Steel	Sail	"	300	—
" " 25 .. ..	"	"	"	300	—
" " 26 .. ..	"	"	"	300	—
" " 27 .. ..	"	"	"	300	—
" " 28 .. ..	"	"	"	300	—
" " 29 .. ..	"	"	"	300	—
Purths .. ..	Iron	"	"	750	—
Irmer .. ..	"	"	"	700	—
Bartels .. ..	"	"	"	700	—
Siemens & Co. .. ..	"	"	"	700	—
Hans .. ..	Steel	"	"	200	—
Erich .. ..	"	"	"	200	—
* Auguste .. ..	"	"	"	100	—
Hans .. ..	"	Screw	"	10	22

By ACTIEN GESELLSCHAFT, "Wiser," Bremen.

† José Gibert .. ..	Steel	Steam	Ur'guay	401-5	200
Tankleichter I. .. ..	"	P. brg.	German	1,900	—
* B. No. 33 A.V. .. ..	"	D'dgr.	"	260	70
" " 34 .. ..	"	"	"	116	130
" " 35 .. ..	"	"	"	136	235
† Schwimmdock II. ..	"	F. d'k.	"	2,100	40
Schwimmkrahne .. ..	"	F. crn.	"	250	—
S. No. 298 .. ..	"	Barge	"	100	—

By STETTINER MASCHINENBAU ACTIEN GESELLSCHAFT, "Vulcan," Bredon bu Stettin.

† London .. ..	Steel	Steam	German	1,251	450
† Kaiser Wilhelm II. ..	"	"	"	6,990	6,400
† Glondrina .. ..	"	"	Foreign	883	650
† Soandia .. ..	"	"	German	4,475	3,000
* Glückauf .. ..	"	"	"	396	280
† Dania .. ..	"	"	"	48,479	3,000
* Meitzen .. ..	"	"	"	396	280
† Berlin .. ..	"	"	"	421	850

By FLENSBURGER, SCHIFFSBAU GESELLSCHAFT, Flensburg.

† Hans Jost .. ..	Steel	Steam	German	962	500
† Diana .. ..	"	"	"	2,100	1,350
† Tai-cheong .. ..	"	"	"	1,301	700
† Tai-lee .. ..	"	"	"	1,301	700
† Occident .. ..	"	"	"	836	360
* Stella .. ..	"	"	"	476	320
† Essen .. ..	"	"	"	2,986	1,300
† Cleopatra .. ..	"	"	"	2,742	1,600
† Desdemona .. ..	"	"	"	2,742	1,600
† Mira .. ..	"	"	"	962	500

By REIHERSTIEG, SCHIFFSWERFTE UND MASCHINENFABRIK, Hamburg.

† Steinhöft .. ..	Steel	Steam	German	2,500	1,250
† Pentaur .. ..	"	"	"	2,600	1,500
† Solingen .. ..	"	"	"	2,600	1,250
† Oceana .. ..	"	"	"	2,600	1,500

By BREMER SCHIFFSBAUGESELLSCHAFT, Vegesack.

* I. to VII (7 h. barges)	Steel	Steam	German	4 215	4 185
* Titania .. ..	Iron	Sail	"	1,108	—
* C. H. Waetjen .. ..	Steel	"	"	1,833	—
* Nereus .. ..	"	"	"	1,834	—
* Bongo .. ..	"	Barge	"	45	—
* Stadt Bremen .. ..	"	Sail	"	55	—
* Wodan .. ..	"	Steam	"	100	250

\* Compound.

† Triple.

‡ High Pressure.

**AUSTRIAN.**

By STABILMENTO TECNICO, Trieste.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Austria M. . .	Steel	Steam	Foreign	635-09	—
* Irene . . .	"	"	"	13-22	—
† Flamingo . . .	"	"	"	—	—
† Marabu . . .	"	"	"	—	—
† Weihe . . .	"	"	Austr'n	78-47	—
† Secretar . . .	"	"	"	—	—
† Harpie . . .	"	"	"	—	—
† Gaukler . . .	"	"	"	—	—
† Conte Kalnoky . .	"	"	Foreign	146-89	—
† Pluto . . .	"	"	Austr'n	260	—
* Negroponte . .	Iron	"	Foreign	257-27	—
† Velebit . . .	Steel	"	Austr'n	189-98	—
§ Kaiser Franz Josef I	"	"	"	4,200	—

**BELGIUM.**

By THE SOCIÉTÉ COCKERILL, Hoboken, Antwerp.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Ville de Gaud . .	"	Steam	Foreign	—	60
† Ville de Liège . .	"	"	"	—	60
* Saigonnais . . .	"	"	"	—	125
† No. 293 Bateau Ram	"	"	Belgium	—	20
* No. 294 . . .	"	"	Foreign	—	123
* No. 295 . . .	"	"	"	—	600
† Le Vase . . .	"	"	"	—	1,250

**DANISH.**

By BURMEISTER &amp; WAIN, Copenhagen.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Rosenberg . . .	Steel	Steam	Danish	1,636	180
† Fredensborg . . .	"	"	"	1,636	180
* Dagmar . . .	"	"	"	332	120
† Douro . . .	"	"	"	815	120
† Pregel . . .	"	"	"	697	120
† Chr. Broberg . . .	"	"	"	1,350	150
† J. C. Jacobsen . .	"	"	"	1,350	150
* Marie . . .	"	"	"	361	130

**FINLAND.**

By WM. CRICHTON &amp; Co., Aktiebolag, Abo, Finland.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. N.
† Algara . . .	Steel	Pad'le	Russian	66	30
† Tschurka . . .	"	"	"	66	30
† Olya . . .	"	Screw	"	6,4	10
† Varya . . .	"	"	"	6,4	10
† Kalmuschook . .	"	"	"	8,5	10
* Launches No. 1-5 . .	Wood	Steam	"	ea. 7,5	10
* " " 6-7 . . .	Wood	"	"	" 13	60
* " " 8-9 . . .	Steel	"	"	" 13	60
* " " 10-11 . . .	Wood	"	"	" 4	8
* " " 12-13 . . .	Steel	"	"	" 4	8
† Nargen . . .	"	"	"	150	500
† Hogland . . .	"	"	"	150	500

\* Compound. † Triple. ‡ High Pressure.

**HOAR & BROWN'S HARDWOOD MARKET REPORT, December 21st, 1889.**

**TEAK.**—The arrivals in the Docks for the last three weeks have been 1,284 loads Moulmein logs, 91 loads planks, 18 loads blocks, 718 loads Rangoon logs, 72 loads planks, 503 loads Bangkok logs, and 143 loads planks, beside sundry other parcels not yet taken into stock.

The deliveries:—	Logs.	Planks.
Moulmein . . .	870 Loads.	97 Loads.
Rangoon . . .	193 "	53 "
Bangkok . . .	294 "	49 "

Although the arrivals have been unusually large lately, and a slight falling off in deliveries is noticeable, there is little prospect of any retrograde movement in prices, as it is expected that the new year will bring several very large enquiries into the market.

A considerable quantity of second-class timber has been landed among the late importations, which has no doubt been the cause of low quotations appearing, but for first-class shipments values remain firm.

The demand for planks is unusually brisk this month.

**MAHOGANY.**—The last week has been characterized by a decided hardening in prices, and appearances point to a continued rise, as many contracts remain uncompleted and supplies are not at all excessive.

**CEDAR.**—The market is still very dull, and shippers are trying to relieve themselves of a burdensome stock. The importers' prices are, however, far in advance of merchants' ideas. The stocks are ample now, and the addition of a further cargo has greatly curtailed any contemplated speculation.

**AMERICAN WALNUT.**—Logs have been enquired for lately, but the quantity in the docks is small, and contains very few parcels of first-class character. Imported boards and planks of good average quality are doing well, the deliveries being large and prices fully maintained.

**SEQUOIA** has not been much inquired for lately, possibly in consequence of buyers preferring to wait until the arrival of the large importations expected at the beginning of next year, when there may be a prospect of lower prices.

**GREENHEART.**—Nothing of any importance to report.

**COMPASSES IN THE ROYAL NAVY.**—In reply to an inquiry by the Committee of Lloyd's, the Secretary of the Admiralty states that no new form of compass has been adopted in her Majesty's ships. Improvements have, however, recently been made in the liquid compasses, with a view to making them more effective in every respect, and capable of withstanding the shocks of heavy ordnance, and abnormal vibrations of the bridges of ships caused by powerful engines. These compasses are fitted with an azimuth circle, especially intended for taking bearings at night and in thick or rainy weather, and are now on trial. The makers of this liquid compass are Messrs. Dent & Co., of 61, Strand. It is the intention of the Admiralty to adopt Thomson's compass.

**INDUSTRIAL AND TRADE NOTES.****THE CLYDE AND SCOTLAND.**

**THE** strike of engineers in the upper district of the Clyde referred to in last month's notes was happily terminated at the beginning of December, and engine shops all over the Clyde are once more in full swing. The settlement was effected by the men offering to accept 3d. per hour of advance on January 1st, and to resume work immediately. These terms were accepted by the employers, and work was resumed in all the shops on December 2nd.

Heavy booking of fresh orders characterised the first two weeks of December, but activity in this respect has fallen away during the latter part of the month. This does not, however, form matter for regret, as the rate at which new orders have poured in for a considerable time has been quite phenomenal, and has given rise to fears as to overbuilding. Between the first day of November and the 10th Dec.—little over five weeks—the new shipping booked by Clyde shipbuilders amounted to close upon 100,000 tons! Representing, as this does, simply a continuity of what has been experienced during several previous months, it may well be believed that Clyde shipyards, engine works, and all subsidiary branches in connection, have a long spell of high-pressure activity before them.

We have received notice that Messrs. James Horne & Co., iron, steel, and general hardware merchants, have removed their place of business from 20, Redcross Street, Liverpool, to 8a, Ramford Place, Liverpool, to which latter place all communications in future be addressed.

The total output of new tonnage during December has not at the present writing been computed, but it will at least be up to the monthly average. This will bring the aggregate output for the year up to about 335,000 tons, a figure only some 85,000 tons short of the largest total for any year.

The most notable of all the contracts fixed since the writing of last month's notes is that received by Messrs. J. & G. Thomson, Clydebank, for the construction of one of four similar battle-ships to be built by private firms for the British Navy. This vessel will have a displacement of 14,500 tons, be propelled by triple-expansion machinery indicating 13,000 H.P., will cost about one million pounds sterling, and is to be completed within four years. In addition to this order, a most important Government engineering contract has been secured by Messrs. Scott & Co., of Greenock, for the construction of tri-compound engines and eight boilers, destined for H.M.S. *Hercules*, built at Chatham in 1868. The new engines, which are to drive a single screw, will indicate over 8,500 H.P.

The London and Glasgow Shipbuilding & Engineering Co., Govan, who have already built a large number of vessels for the same owners, have contracted with Messrs. McGregor, Gow & Co., of the Glen Line, to construct for them a steel screw steamer of over 3,000 tons gross, to be fitted with triple-expansion engines.

Messrs. Ross & Duncan, Govan, have contracted with foreign owners to supply a screw steamer 140 ft. long, 22 ft. broad, and 10 ft. 6 in. depth of hold, with engines of the compound surface-condensing type, having cylinders 16 in. and 32 in. diameter, and 22 in. stroke. While Messrs. Ross & Duncan will build the engines, the hull will be constructed by Messrs. Fullarton & Co., Paisley.

Messrs. William Denny & Bros., Leven Shipyard, Dumbarton, have received the contract, from amongst a goodly number of competitors, for the construction of a powerful steel twin-screw steamer of upwards of 6,000 tons for the South African trade of the Union Steamship Co., of London. This vessel, which will be the largest ever launched at Dumbarton, is intended to have great speed, and will be fitted in the most luxurious manner as a passenger steamer of the first class. She will also be arranged as to qualify her for employment by the Admiralty as an armed cruiser.

Messrs. Denny & Bros' neighbours, Messrs. A. McMillan & Son, have not been doing very much lately, but have recently booked an order for a large four-masted sailing ship.

Messrs. Russell & Co., Port-Glasgow, have contracted to build a large sailing ship for a Glasgow firm, and they have sold two ships, each of 2,600 tons, one to a Liverpool and the other to a Glasgow firm.

Messrs. McKnight & Co., Ayr, have contracted with Mr. David Rowan, jun., shipowner, Ayr, on behalf of the Garnock Steamship Co., Limited, Ayr, for two steel steamers, 175 ft. long, 25 ft. beam, and 12 ft. deep, and of 530 tons deadweight capacity. William Kemp, Govan, is to supply them with triple-expansion engines to give the vessel a speed of 10 knots, loaded.

The shipyards and engineering works of Dundee are necessarily sharing in the general briskness. Messrs. Alex. Stephen & Sons and Messrs. Gourlay Bros. & Co. have obtained power from the Works Committee of the Harbour Board to effect an extension of their shipyards. Messrs. Gourlay are about to lay the largest steamer ever built at Dundee. The vessel will be between 3,000 and 4,000 tons register. The Messrs. Stephen are to build a sailing vessel of 2,200 tons.

It goes without saying that the constructive material for all the new vessels ordered will be the now universally approved Siemen's "mild steel." The use of this material has so inordinately exceeded the facilities for producing it that the rate of production of the Clyde shipyards has been much retarded. Happily this state of things is being gradually improved, and at the present time several very important accessions to the steel manufacturing industry are being made.

The warships now building on the Clyde, or in course of being equipped are, of course, to have an electric light installation. In every case the contract for this work is in the hands of Messrs. Muir, Mavor & Coulson, of Glasgow. H.M. ships *Intrepid*, *Indefatigable*, and *Iphigenia*, building by the London and Glasgow Shipbuilding Co., Govan, will each have an installation of about 300 incandescent lamps. The Australian cruisers *Phenix* and *Psyche*, of which Messrs. James & George Thomson, Clydebank, are the builders, will have an installation of some 250 such lamps, with projector or search light in addition. On the *Gibraltar*, which is in the hands of Messrs. Napier

& Sons, Govan, there will be an installation of about 500 lamps, and the Japanese cruiser at Clydebank is also to have a 250-light installation.

The agents of the Inman Co., at Liverpool, have placed the *City of New York* in the hands of her builders (Messrs. James & George Thomson) for repair of damage to her shafting resulting from recent stranding near Sandy Hook. The celebrated Atlantic racer arrived in the Clyde early in December, and has since been the subject of interested scrutiny to all passing up and down the river.

## TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—The returns of tonnage launched on the Tyne during the past year have been published, and as was confidently expected the result shows a total output far in excess of the highest previous record. The aggregate tonnage launched by the shipbuilding firms on the Tyne was, in round numbers, 280,000 tons, and adding to this the amount launched by a few small firms who devote themselves to the building of tug-boats, river steamers, and steam launches, a grand total is made up of 281,710 tons. The nearest approach to this immense output was achieved in 1883, when 216,000 tons were put off the stocks. It may be stated that there are more yards now in operation than in the year mentioned; for though the Scotswood yard, which then belonged to the list of working establishments, has since been closed, there have been added to the number of "going concerns" the Elswick yard of Messrs. Armstrong, Mitchell & Co., as also the yard of Messrs. Wood & Skinner, at Bill Quay, and that of Messrs. W. Dobson & Co., at Walker, thus making twelve yards at present in operation, as against ten in 1883. Work having been equally abundant, however, at each of the periods under consideration, some other cause than the addition of two comparatively small establishments, must be found to account for the difference of over 65,000 tons in the output. The great improvement that has been effected in the plant and machinery of the different yards is no doubt the chief factor in the increased productive capacity manifested in 1889, as compared with 1883, and as the adoption of improved appliances continues to be a matter of very frequent occurrence, it is needless to say that the effect upon the output returns will be still more strongly shown in the future. Great as is the output of 1889, it cannot be said to accurately represent the full productive power of the district, for during the year there were obstructive causes in operation which, to a greater or less extent, impeded the efforts of every firm on the river to forward the execution of contracts. These were the difficulty of procuring supplies of material from the steel and iron manufacturers, and the practice of absenting themselves from work without adequate cause adopted by certain sections of the workmen. The first of these evils was, towards the close of the year, greatly minimised by the extension of productive resources at Jarrow and Consett, and in a very short time it will be further provided against by the addition of large plate and angle-rolling mills to Messrs. John Spencer & Sons' great works at Newburn. The erection of these mills is already well advanced, and the name of the firm who have engaged in the enterprise is a sufficient guarantee that the new works will be equipped in a thoroughly complete and effective manner. Against the other evil referred to, viz., the time-losing propensity among the workmen, the employers have a remedy if they choose to exercise it, and this consists in merely putting into force their prerogative of dismissal, as the penalty for non-attendance. Most employers, however, are averse to resorting to this drastic measure, but without any approach to harshness they might greatly mitigate the evil spoken of by the exercise of a little more firmness in dealing with the irregular attenders. Every builder in the district begins the year with orders enough in hand sufficient to keep their yards busily going to within a very short period of its close, and a continuance of the activity now existing is therefore assured for that period. What will come after, it is difficult to foresee at this moment, but those who should be most competent to judge incline to the belief that the present state of production must necessarily flood the market long before the close of 1891. The building of war-ships at the Jarrow & Elswick yards will, no doubt, keep those great establishments in full activity for a much longer period, and in

these cases no falling off of business is likely to be experienced for at least three years. Messrs. Hawthorn, Leslie & Co. have some very high-class work to deal with during the coming twelve months, and their commodious graving dock is likely to be as constantly occupied as it has been during the twelve months just passed. The firm have put the finishing touches to many of the splendid steamers launched by themselves during the year in the dock, but they also utilized it for the carrying out of a number of extensive repairing contracts, and the working of this department has, on the whole, been eminently successful in the past twelve months. The new dock at Jarrow, which was opened during the summer months, has been seldom without an occupant, and for some time to come a well-sustained demand for its accommodation is anticipated. The repairing business at the North and South Shields dock-yards has been fairly active during the year, and, at the time of writing, most of them are occupied with vessels being painted or overhauled.

**Engineering.**—It is not surprising to find that the output of engines from the marine engineering establishments in 1889 has, like the shipbuilding record, greatly exceeded anything hitherto achieved. The output from each of the works was satisfactory, but that from the Wallsend Slipway and Engineering Co.'s establishment was, we think, particularly so. That enterprising firm fitted on board and sent away to sea 25 sets of triple-expansion engines during the year, the aggregate indicated horse-power of which amounted to 35,000. The firm have lately accomplished a somewhat remarkable feat in the way of fitting machinery on board vessels. Owing to several vessels for which they had engines building being behind time, something in the nature of a crush occurred at the end of September, all of them arriving at the works to have their engines fitted simultaneously. The difficulty, however, was very effectually disposed of, for, in the five weeks from September 23rd to October 29th inclusive, the firm supplied six vessels with their machinery, representing a total indicated horse-power of 11,000. Nothing, we think, could be better calculated to show the exceptional resources of the establishment than the interesting fact just noted. Messrs. Clark, Chapman & Co. close the year with all their departments working double shift, and the number of the orders now in the hands of the firm for their specialities, and more especially for those used exclusively on steamships is so great as to be unprecedented. Messrs. Ernest Scott & Co., Close, have, since their appointment as licensees for the manufacture of the Priestman oil engine for launch and marine purposes, received several orders for the speciality, and also for their inverted cylinder mill engine, which is really the marine engine fitted with automatic expansion gear and flywheel. There is a large demand for this latter engine, for mills and electric lighting installations, and this is not to be wondered at, seeing that it possesses many advantages over the horizontal engines now so much in use. In the chain and anchor trade, business continues brisk. Mr. Wasteneys Smith has received an order for the anchor outfits for two war-vessels now building for a foreign government, in which the system of carrying his stockless anchors stowed up the hawse-pipes has been adopted. He has also received from one builder alone orders for the lower anchors for twelve large steamers, and has, in addition, secured the outfit for an Atlantic passenger ship, as well as a number of orders from abroad, where his anchors are coming greatly into use.

**Electric Lighting.**—Messrs. Ernest Scott & Co. have recently received several important orders for electric lighting installations, and are now busier in this department than at any time for twelve months past. Among the installations recently contracted for may be mentioned a very important one for the workshops connected with the Manchester Ship Canal. The firm are now turning out from four to five dynamos per week, besides switches, "transformers," and other electrical apparatus. The Newcastle and District Electric Lighting Co. are laying down the main pipes from their central station at Forth Banks to the different centres of distribution, and it is expected that early in January they will be in a position to carry out their engagements with respect to the lighting of the premises of customers.

#### THE WEAR.

**Shipbuilding.**—The shipbuilders of the Wear have, like their neighbours of the Tyne, beaten all their former records in the output for 1889, and there is no reason to doubt that they will do equally well in the year upon which we are now entering. They are disinclined to enter into negotiations for

further orders at present, their engagements for the future being already sufficiently numerous. Messrs. J. L. Thompson & Sons have acquired an extensive piece of ground adjoining their Manors Quay establishment, which addition to the premises will enable them to largely increase the quay accommodation. The same firm are engaged in extending the fitting shop connected with their forge at Pallion, a course which has been rendered necessary by the increasing pressure of work. Messrs. Pickersgill have already laid down the keel for a steamer of nearly 6,000 tons carrying capacity in the new ground recently added to their yard. The firm have two four-masted sailing ships to build—one for Liverpool and one for Belfast. Messrs. R. Thompson & Sons intend launching the "cable" ship which is on the stocks early in January, and when this event takes place it will be found that the construction of this vessel from the laying of the keel to the putting off the stocks has been a rare example of rapid execution. Mr. Laing and Messrs. W. Doxford & Sons have each vessels of an important class in hand, in which electric light installations are to be fitted. Messrs. M. Robson & Son, Monkwearmouth, have commenced the construction of steel boats, their first order having been obtained from a Tyneside firm of eminence in shipbuilding. The keel and frame of the boats are wood, the shell only being steel.

**Engineering.**—The Marine Engineering Works on the Wear will commence the year with the best possible prospects, the possession of unlimited work being in the case of every one of the firms the main feature of the situation. To say "unlimited" is no exaggeration, as all of them could have more work if they chose to take it, on the understanding, however, to ensure delivery within a year. Manufacturers of steam winches, steering gear, &c., have also plenty of orders to ensure sustained briskness in their works to the end of the year. The iron manufacturing firm of Messrs. S. Tysack & Co. has been formed into a limited liability company, with which several local gentlemen of influence have associated themselves.

**The Hartlepool.**—The firm of Messrs. W. Gray & Co. occupies this year the honourable position of second place on the output returns for the shipbuilding establishments of the United Kingdom, the first place being held by the Palmer's Shipbuilding and Iron Co., Jarrow. The 58,731 tons launched by the Hartlepool firm, however, represents the largest output per berth of any building yard in the world, and the fact redounds to the credit of all connected with the establishment. Messrs. Withey also show very creditably in the returns, with a total of over 21,000 tons launched, and for a comparatively small productive capacity. Messrs. Irvine & Co. have done well. Messrs. T. Richardson & Sons fitted during the year thirty-one steamers with triple-expansion engines, the aggregate I.H.P. of which amounted to 44,800 tons. In addition to this output of engines, however, the firm supplied 101 steamers with their well-known steel-built crank shafts and propeller shafts. They have also turned out from their forging department a large number of heavy stern frames and ship's forgings for local shipbuilders, besides shipping many sets of engine forgings to the Continent. The firm has commenced the manufacture of an evaporator, the invention of Mr. Morison, the manager, and have already supplied it to over 50 steamers, while a great many more are on order. The purpose of the apparatus is to supply marine boilers with auxiliary feed water, by which means the formation of undue scale is prevented. In the Central Marine Works a great many large contracts are now in progress, and an extension of the foundry department is being carried out.

**Stockton.**—The whole of the Stockton shipbuilding firms have shown up well on the output returns for 1889, and all of them have at the present time their berths fully occupied with vessels in different stages of progress. Since November 19th the following vessels engaged by Messrs. Blair & Co. have had their trial trips, the result in each case being completely satisfactory:—The s.s. *Raisby* built by Messrs. Ropner & Son, of Stockton, for Messrs. Ropner & Co. of West Hartlepool, having engines of 160 H.P.N., with cylinders 21 in., 35 in. and 57 in. by 3 ft. 3 in. stroke. The s.s. *Kara* built by Messrs. Swan & Hunter, Wallsend, for the Mercantile Steamship Co., of London, having engines of 180 H.P.N., with cylinders 22½ in., 36½ in. and 60 in. by 3 ft. 3 in. stroke. The s.s. *Orion* built by Messrs. Rayton, Dixon & Co., Middlesbrough, for Messrs. T. & G. Harrison, of Liverpool, having engines of 250 H.P.N., with cylinders 24 in., 40 in. and 66 in. by 3 ft. 9 in. stroke. The s.s. *Zoe* built by Messrs. Turnbull & Son, of Whitby, for Messrs. Twiner, Brightman & Co., of London, having engines 175 H.P.N., with cylinders

22 in., 36 in. and 59 in. by 3 ft. 3 in. stroke. The engines for the whole of these vessels are constructed to work at 160 lbs. pressure of steam. The firm continue to have an abundance of work in their shops.

**Middlesbro'**.—Messrs. Raylton, Dixon & Co. continue extremely busy, having all berths filled, and a good many orders in reserve. Messrs. Harkess & Sons are preparing to launch two vessels next spring tides. This firm have lately added to their plant a new Cameron double punching machine, and are in other ways taking measures to increase the effectiveness for productive work of their establishment. Messrs. Craggs are plating a vessel ordered by Messrs. Edwd. Harris & Co., and have another of large dimensions on the framing stage. In the engineering works, foundries, steel works and iron works activity is still the feature.

### NORTH-WEST OF ENGLAND.

**Barrow-in-Furness.**—There has been considerable activity in the shipbuilding and engineering trades of the North-west of England during the past month, but no new orders are reported. As a matter of fact local builders have their hands well filled with pressing contracts, and are not anxious to increase their responsibilities in face of the high price of material, and the difficulty in buying well forward, and the uncertainty of the temper of the men. One of the greatest difficulties experienced of late in the shipbuilding trade is the scarcity of material, and in the waiting and delay which has been occasioned in the delivery of plates, angles, and other sections urgently wanted in the construction of ships on the stocks. To some extent this difficulty has been overcome, and the work of construction has, as a consequence, proceeded more regularly and more satisfactorily. At Barrow the Naval Construction & Armaments Co. are making marked progress with the work of building the three second-class cruisers for the Navy. They are not only fully framed, but well forward in plating, and attention is being directed to the building up of the heavier frames and plates which are on the water-line. It will be, however, some months before any of these three cruisers are launched. This company has also in hand the second steamer for Messrs. Elder, Dempster & Co., of Liverpool, to be named *Coomassie*. She will be launched in February. Her sister ship, the *Soudan*, had a successful trial trip on December 11th. She steamed out of the docks at Barrow, and cruised about in the Irish Sea all day with a mean rate of steaming equal to 12½ knots per hour. When put on full speed she indicated two knots per hour more than her guaranteed speed. The owners are not only highly pleased with the steamer, but have expressed to the Naval Construction & Armaments Co. the great satisfaction they have in the work done, and the kindly and pleasant way in which they have been able to work with the builders. The *Coomassie* will be the fourth steamer of this size and power built by the Naval Construction & Armaments Co. The *Soudan* leaves in a few days with a cargo of steel rails, &c., for the Cape of Good Hope, *via* Southampton. Much energy is being directed at the Barrow yard in the construction of the three high-speed Canadian Pacific steamers, and as these steamers have to be delivered to the owners soon after the close of the current year, it is evident there will be great activity in the Barrow yard during 1890. In many quarters disappointment has been felt that the contracts for line-of-battleships and first-class cruisers for the Admiralty have gone entirely away from Barrow, but it is not an unmixed evil, as it is known that the successful tenders were something like £40,000 per steamer below the prices of other builders of good repute, thus leaving next to no margin of profit, and probably no profit at all. The belief is entertained in this district that more profit and satisfaction will be obtained from a large trade in mercantile marine, the demand for which is brisk and likely to be more so in the new year, despite the advance in steel shipbuilding material.

A strike of pattern makers occurred at the yard of the Naval Construction and Armaments Co. on Monday, December 16th. They complain that the joiners are entrusted with the work of making patterns for the heavy castings used in the hulls of ships. The joiners who have done this work for some time refuse to give it up to the pattern makers, and a strike of the latter has therefore ensued, under the auspices of the United Pattern Makers' Society. About 50 men are out on strike.

Mr. David Caird, the owner of the Graving Dock Shipyard at Barrow, is making overtures for the sale of the place to a com-

pany. The yard, which is admirably situated, has a good launching area, and is within a few hundred yards of the Barrow Steel Works, where all classes of steel shipbuilding is manufactured. It is also within a similar distance of the engineering and boiler works of Westray, Copeland & Co., Limited, which firm has already made a good name in marine engineering.

There is also some talk about the reopening of the Vulcan Steel Forge Co.'s works at Barrow, with a view to adapting them for the manufacture of steel shipbuilding material and other steel products which are at present in good demand.

A proof of the importance of taking engines of an obsolete type out of steamers and replacing them with modern triple-expansion engines is furnished in the experience of the s.s. *Paraense* of the Red Cross Line lading from Liverpool to the Brazils. She was re-engined by Messrs. Westray, Copeland, and Co., of Barrow, and not only succeeded in outting the record between Coral and Liverpool, but the new arrangements in the engine-room and the economies obtained showed the following results: the *Paraense* now carries 50 tons more cargo than before her alterations, steams two knots faster and burns four tons of coal a day less, taking into account the extra speed.

**Whitehaven.**—There is nothing doing in shipbuilding at the yard of the Whitehaven Shipbuilding Co., and the yard is still "on sale." Many of the shareholders, who were only called upon a few months ago for £2 10s. per share with the view of resuscitating the company, object to the policy of the directors in endeavouring to sell the yard at a sacrifice, but urge that efforts should be made to get orders for steel sailing-ships at the present time when the demand is so brisk and good. The yard is not adapted for the building of steamers as there are no engineering works in connection with them.

**Maryport and Workington.**—There is a brisk business in shipbuilding at Workington and Maryport, but at these yards only small craft is built. The demand for small craft is, however, very active, and a good trade is offering for next year.

### THE MERSEY.

THE year just closed has been a very satisfactory one for all the shipbuilding industries on both sides of the Mersey. A very largely increased weight of work has been completed in the various shipyards as compared with the previous year, and the marine engineering establishments have all been extremely busy. With the increased activity there has, however, been a steady upward movement both in the wages of the men and in the cost of production, which has absorbed to a considerable extent the advantages resulting from the improvement in trade. The certainly better prices at which builders have been able to secure contracts for new ships, and which engineers have been able to command upon the work they have turned out, have, however, moved up fairly in proportion to the advance in wages and the increased cost of material, and except that, possibly a few vessels which might otherwise have been placed out with English firms are being built in Foreign yards, the advance in prices does not seem in any appreciable measure to have checked the general activity in trade, whilst the prospects for the ensuing year are very encouraging. The total tonnage turned out by the shipyards on the Mersey during the past year has amounted to 35,773 tons, as compared with 22,538 tons in 1888, showing an increase of no less than 18,335 tons on the previous year, whilst the total for 1887 was only 10,664 tons. This, however, was a year of exceptional depression and only about half the tonnage was turned out as in the previous year, 1886, when 20,966 tons were built. The work turned out during the past year has been distributed among the shipbuilding firms on the Mersey as follows:—Messrs. Lance Brothers have built six steel screw steamers, the *Columbra*, 7,363 tons gross and 13,500 I.H.P.; the *Cambria*, 310 tons and 1,100 H.P.; the *Lynx*, the *Antelope* and the *Gaselle* each 596 tons and 1,650 H.P.; and the *Russia*, 4,017 tons and 5,500 H.P. Messrs. W. H. Potter & Sons have built the steel sailing ship *Sierra Ventana*, 1,853 tons, the iron ship *Alycane*, 2,219 tons; the iron ship *Falkland*, 2,804 tons; and three small iron sailing vessels, each of 274 tons. Messrs. Thomas Royden & Sons have built the following: the steel steamer *Rossmore*, 4,455 tons and 450 N.H.P.; the steel steamer *Toronto*, 2,106 tons and 150 H.P.; and the steel sailing ship *Hollinswood*, 2,673 tons. Messrs. R. & G. Evans & Co. have built the two iron sailing ships *Talca*, 1,136 tons, and *Holyhead*, 2,336 tons. Messrs. John Jones & Sons have turned out the following; the

steel steamer *Monlanes*, 359 tons; and *Purus*, 228 tons; and the iron steamers *Count Ignatieff* and *Roumania*, each of 181 tons. Messrs. Cochran & Co.'s list embraces seven steel and four wooden steamers, and five steel sailing barges, ranging from four tons to 300 tons, the total for this firm being 942 tons. In general repairs there has been a large amount of work doing in all the various yards, and Messrs. Clover, Clayton & Co., who made a speciality of this class of work have had a considerable number of contracts, amongst the work done by them being the refloating of the wrecked steamer *Tudor*, which went ashore off Crossington and broke her back, the separate halves being bulkheaded up and successfully taken into the graving dock.

Messrs. Laird Brothers, of Birkenhead, continue very busy in all their departments, and since our last report they have secured a contract for building one of the four large battle-ships which the Government have decided upon adding to the Navy, and which are to be built in private yards. The ship which Messrs. Laird Brothers are to build is the *Royal Oak*, which will be turned out complete with her propelling machinery. Her length will be 380 ft., her breadth 75 ft., and her depth to upper deck 45 ft. She will have a displacement of about 14,000 tons, and her engines are to develop 13,000 I.H.P., and a speed of 17½ knots. She will carry four 67-ton guns, mounted on two barbettes, and a very powerful auxiliary armament. The thickness of the armour plating on the hull is to be 18 in., and that in the barbettes 17 in. She will be built in one of the docks at the works, from which she can be floated out with all her armour plates in position. She will then be taken to Messrs. Laird's premises on the Great Float, near the new boiler shop, when the boilers will be put on board, and the vessel prepared for sea. It is expected that from three to three and a half years will be occupied in building the ship. The firm have just completed the new steamer *Russia*, for the Hamburg-American Steam Packet Co., and her performance in the official trial trip at the mouth of the Mersey was in every way satisfactory, amply fulfilling the requirements of the contract. The vessel has now been taken over by the representatives of the company, and has arrived at Hamburg, making the voyage at an average speed of 14 knots per hour. The *Russia* is of 4,017 tons gross register, and 3,500 I.H.P. She is intended for the company's emigrant and cargo service between Hamburg and New York, and though she has handsomely fitted accommodation for a few first-class passengers, her special feature is her very complete installation for steerage passengers, of whom she will carry about 1,300. They are placed in the main and lower decks, all the berths being of wrought iron, and subdivided into small compartments, so as to make them as private as possible. Great attention has also been paid to the ventilation and lighting of these spaces. The latrines, washhouses and other sanitary arrangements are contained under the shelter of the poop and forecastle, to which there is access from below. The emigrant fittings are all portable, and can be removed at that time of the year when it is desired to carry cargo only and no emigrants, but even when full of the latter, she will have a large space available for cargo. The vessel has been built under special survey for the Bureau Veritas highest class, including their special mark as being practically unsinkable. Messrs. Laird have also just completed a very successful conversion of the machinery of the steamer *Sicily*, belonging to Messrs. David McIver & Co. into quadruple compound engines. The trial of these engines made at the commencement of the month, gave most satisfactory results, the machinery working without a hitch, and the power developed exceeding what was expected. The engines were quadrupled by placing two new cylinders tandem fashion, having piston valves, rods, and connections complete on the top of the old cylinders, which were not moved from the ship, but a liner fitted in the old low pressure cylinder. A cylindrical boiler, working at 180 lbs. pressure, large enough for the power requisite on ordinary work, but fitted with forced draught on the closed ashpit system, in case a greater power is required, was substituted for the two original ones working at 65 lbs. The weight saved in the machinery and the expected economy of fuel of about 20 per cent. as compared with the old engines, will greatly increase the freight-carrying capacity of the *Sicily*, and as this is the first pair of engines which Messrs. Laird have converted into quadruple compound it is satisfactory to note its complete success. Two sets of triple-expansion engines, of 4,500 I.H.P. which Messrs. Laird have built for the British Government torpedo boats, *Speedwell* and *Skipjack*, have just been tested upon the above boats with open stokehole trials,

and have given most satisfactory results. These engines are of the specially light type now adopted for the torpedo boats and exceptionally high speed, running about 320 revolutions per minute. The firm have a number of other important ship-building orders and heavy repair jobs in hand, which will keep their Birkenhead works busy for at least fully over the ensuing year.

Messrs. Cochran & Co., of Bidston Wharf, Birkenhead, are exceptionally busy in their marine boiler department, and have a large number of orders in hand for their special and well-known type of boilers. In fact this branch has so considerably developed of late that during the past autumn they have found it necessary to largely extend their plant and have doubled the number of their rivetting machines, which are driven by hydraulic power. The demands of the workmen, however, for increased overtime allowances, have recently tended to very seriously cripple operations, and in the place of working constant night shifts, which has been the case for some time past, but which would now entail practically the payment of a double rate of wages, the firm have decided simply to go on ordinary time. The type of boilers upon which the firm have chiefly been busy have been their patent vertical multitubular boiler with horizontal flue tubes, the special features of which are a dome-shaped fire-box and a group of horizontal flue-tubes above the fire-box, encased in the vertical cylindrical shell, whilst they are also so constructed that no special internal stays are necessary. In their boat building department the firm are also fairly busy, and they have at present in hand two small steamers constructed of steel throughout for Brazil. One of these is a passenger tender and the other a small tug boat. The tender is fitted with compound non-condensing engines and the other with ordinary high-pressure engines. During the last few months the firm have had their works inspected by the Navy Branch of the Admiralty, with the result that they have been put on the list of builders of Navy pinnaces, steam launches, &c. During the year they have executed some important contracts from the War Office, India Office, and in the construction of special boats for submarine mining service.

In the Manchester district all the engineering firms engaged upon tools and plant for shipbuilding and marine work continue exceedingly busy, and it may be interesting to notice that the Allen Patent Portable Pneumatic System of Rivetting, introduced about three years ago by Messrs. De Berque & Co., of Manchester, is being largely adopted in a number of shipbuilding yards, and appears to be steadily taking the place of hydraulic rivetting. It is not only being gradually adopted by shipbuilders, but it is being extensively applied to bridge and girder work by many of the leading firms employed in this branch of trade. Amongst other Pneumatic Rivetting plants lately installed is an important one in the yard of the well-known firm of Messrs. Harland & Wolff, Belfast. Messrs. De Berque & Co. have also orders in hand for a number of other plants, which will occupy them for some time to come, and they are now making an important addition to their fitting shops to give them increased facilities for carrying out this class of work. They are also very busy with their other special tools; amongst others they have in hand for America a large automatic multiple punching machine, for punching bridge plates up to 4 ft. wide, and 25 ft. long at one operation, and to any pitch.

Messrs. Hulse & Co., of the Ordsel Works, Salford, have for some time past been very busy on the production of special tools for marine engineering work, and they have introduced a number of new designs and improvements, which have been adopted in some of the principal marine engineering works in this country, whilst they have also executed considerable orders for abroad. We have not space in this notice to enter into detailed descriptions of the various specially-designed machine tools that are being introduced by Messrs. Hulse, but in a subsequent issue we intend giving illustrations of several of these, with full particulars of their construction. One special tool, which they have been exceptionally busy on for some time past, is their Patent Duplex Lathe, with four cutting tools suitable for turning for either parallel or lesser parts of propeller shafting. Other tools are a combined vertical and horizontal planing machine, of which the firm have made upwards of 40 of various sizes, and a vertical cylinder boring machine, capable of boring cylinders up to 20 in. in diameter, and they are also making special designs in horizontal, drilling, boring, milling, lapping, and studding machines.

Messrs. Crossley Brothers, Limited, of Openshaw, near Manchester, have taken up the manufacture of the patent

Pneumatic Tool, and this is being pretty largely adopted for the caulking of marine boilers. Visiting their works during the past week, we had an opportunity of seeing one of these tools in operation, caulking a marine boiler supplied by one of the local firms, and the work done was certainly of most excellent quality. These tools have been supplied to shipbuilding yards on the Clyde and the Tyne, and it is claimed for them that with one of these machines, a single workman can do as much caulking in a marine boiler as six men would get through with the ordinary tools, whilst boilers which have been caulked by this method have been subjected to the highest pressure with the most satisfactory results. When the pneumatic tool was first introduced, one great objection to it was its extreme weight, but Messrs. Crossley Bros. have introduced improvements which have overcome this objection, and the pneumatic tools employed for the caulking of boilers are of quite a handy size and easy of manipulation. They are worked at a pressure of about 60 lbs. to the square inch, each tool requiring about 30 ft. of compressed air per minute, and with this comparatively light pressure there is no difficulty in conveying the compressed air to the tool through ordinary piping.

In the iron and steel trades the past year has been one of a steady progressive upward movement in prices, and upon all materials used either in shipbuilding or in the marine engineering industries. In pig-iron the advance has ranged from 25s. to 30s. per ton, whilst upon manufactured iron it has been fully £2 10s. to £3 per ton. With regard to both raw and manufactured steel, the advance has even been more marked than this, owing, no doubt, to the exceptional activity which has prevailed in all branches of shipbuilding and the consequent large demands for steel plates both for shipbuilding and boiler making purposes. Upon hematites there has been an advance of fully 35s. per ton, whilst steel boiler plates have moved upwards to the extent of nearly £2 per ton. Even with this very large advance in prices there is certainly no indication that the upward movement has yet reached its topmost point, and there is a general belief that during the ensuing year there will be a still further strong advance in the price of all descriptions of material.

The iron market closes the year with a very firm tone generally. There is a large amount of business being put through, but considerable enquiries are being put forward, and there are more actual orders offering than either makers or merchants care to entertain. This, to some extent, is due to the uncertainty with regard to wages' questions, and the cost of material in the future, and sellers do not care to bind themselves to any very heavy engagements. The belief is pretty prevalent that with the turn of the year there will be a considerable amount of buying, and that prices for all descriptions of material will show a renewed strong upward movement. For pig-iron prices close firm at about 71s. 6d. to 72s. 6d. less 2½, as the minimum quotations for local and district brands; some descriptions, such as the best foundry Derbyshire irons, being quoted as high as 78s. 6d. less 2½. Middlesbro' is very firm at 72s. 4d. net cash, delivered equal to Manchester, and in Scotch iron, prices for which have been very irregular of late owing to cheap second-hand parcels being forced upon the market, quotations are now steady at about 70s. for Eglanton, and 73s. 4d. for Glengarnock, delivered at the Lancashire ports. Manufactured iron is in good demand, with a very strong upward tendency in prices. Taking bars as the basis, £8 5s. to £8 10s. are now the minimum quotations for delivery in the Manchester district, and a further advance is almost certain with the commencement of next year, whilst local merchants are contemplating putting up their list rates for iron taken out of store either 10s. or 20s. per ton. Steel plates have been only in limited request recently, but local makers are very firm in quoting £11 15s. for boiler making qualities, delivered to consumers in the neighbourhood of Manchester. Scotch makers, however, are offering for forward delivery at considerably under this figure.

In the metal market there has been a continued active demand for all descriptions of manufactured goods required for steam, and general engineering fittings and list rates have advanced considerably during the past month, list quotations for delivery in the Manchester district being now on the basis of 7½d. per lb. for solid drawn brass boiler tubes, 8½d. for condenser tubes, 9½d. for solid drawn copper tubes, 6½d. for brass wire, 8½d. for copper wire, 6½d. for rolled brass, 7½d. for cast composition sheet nails and spikes, 9½d. for red metal do., 9½d. for wrought copper rivets and washers, and 9½d. to 10½d. for wrought copper boat nails. Even at these figures manufacturers are declining to entertain further business, as they are so

fully sold that they cannot book orders for anything like early delivery, and a further advance upon list rates is certainly more than probable before very long.

In the timber trade imports of most articles have again been in excess of requirements, and although deliveries have also been large there has been comparatively little animation, and values have been with difficulty maintained. Stocks of all descriptions of timber are ample, and in some instances too heavy.

## WELSH NOTES.

**N**OTWITHSTANDING the strong opposition of Cardiff and Barry, Swansea is advancing. Her trade for November was the highest on record. The imports and exports together amounted to 188,992 tons in November, 1888, whilst for the corresponding month this year they amounted to 237,918 tons. The export of coals alone amounted to over 100,000 tons. This is a mere bagatelle beside the figures of Barry and Cardiff, but all the same they are high enough for Swansea not to be ashamed of.

Sir George Elliott has told the Newport Chamber of Commerce he will have nothing to say to them about the drawbacks of the Alexandra Dock which have, it is alleged, done so much to retard Newport's trade. Rank may impose obligations, but in Sir George's case the rank of M.P. for Newport does not impose upon him the duty of doing a, to him, very small thing to help the Newport people. He is Chairman of the Alexandra Dock Co., and could, we should think, soon remove all the troubles of Newport's merchants. But he says they must direct their communications to the Dock Co. By the time the next election comes Sir George will have a strange kind of feeling, we should think, if Newport refuses him. It would be a lesson which this gentleman richly deserves. But then there are a good many baronets in the same position.

For idiotic underheadedness commend us to a South Wales man with a colliery to sell. One of these men was in London some time since with a group of collieries and one solicitor. They were introduced to a syndicate prepared to purchase the four collieries offered, but the solicitor and his client would give no particulars, would do nothing except talk and glare through their highly respectable spectacles until they were paid 10 per cent. caution money; they wanted, say, £8,000 for a pig in a poke. If Taffy thinks he can do business with his beloved collieries in any such way as this he is woefully mistaken. Common sense is not entirely confined to "Cardiff the Cocky."

Newport, Mon., as we think, we have before observed possesses a peculiar commercial growth, a kind of monstrosity known as Newport Harbour Commissioners. This body has charge of the river Usk and collect dues from the shipping. The concern collects the dues and conserves them, it is in fact a kind of Usk Dues Conservancy Board. It found it so difficult to get through its money some time since, that it started a picture gallery, and from the walls of the Board-room there glowered the visage of Mr. Blank, "at one time Chairman of this Board." Then they went in for Brussels carpets, picnics, and such like luxuries. It is, indeed, an open secret that one of the Conservators was put out so much at seeing one of the office boys smoking a pipe, that a sum was at once voted to keep the staff supplied with cigarettes. A stop was put to this sort of thing by a gentleman named Burton, who had the Conservators taken before their betters "at ye signe of ye Griffin," in the City of London. The betters said this extravagance had to be stopped, and that the gentleman in the frame had to come out of that. Mr. Burton thought that in future the Commissioners would spend money in improving the river, but they didn't—they bought gas shares instead. Why a public body should exact dues from shipping without doing any good for the shipping nobody knows. An attempt is about being made to alter this way of carrying on. A new Commissioner was elected with others recently, whose name is Watson, a partner in the firm of Pyman, Watson & Co., Cardiff and Newport. At a recent meeting he gave notice of his intention to move a resolution that steps be taken at once to improve the navigation of the river. We are open to bet Mr. Watson 10 to 1 that he does not carry his motion. He will be supported by some of the members who know the needs of the river, but the Brussels carpet and light luncheon brigade will be too many for him. And then these Newport people make a fuss because the trade

of their river is falling off. Considering that for years and years past they have been content to stand by and see their river shamefully neglected, what more do they deserve? But "Stay, please," as that delightfully ill-tempered old Justice Field says, these worthy Commissioners are about doing something—they are seeking Parliamentary powers to enable them to hand the Newport Corporation £10,000 towards constructing a subway beneath the Usk.

We understand Messrs. Mordly, Carney & Co., Limited, of Newport, ship repairers and dry dock owners, have just declared a dividend at the rate of 19½ per cent. It is well to bear in mind, however, that their capital is only some £16,000. Let them be burdened with as much capital as many works no bigger than theirs have to pay on, and we should not hear so much in this district of the wonderful dividends of this concern.

The Swansea Harbour Trust is a wonderful concern. They want a new clerk and a solicitor, but there are people harsh enough to say that this official must possess a particular name. However this may be, at a recent meeting of the trustees there was a discussion almost as huge and as exciting as that to which we referred in our last month's notes. Since those notes were written, two applicants had been selected for the post. One upon being asked how much salary he would accept, provided he was allowed private practice, replied £300. This in face of the fact that two members—the lecturing members referred to in our last—insisted that no solicitor would accept the post at less than £500 per annum with private practice. The whole question is now to be reopened. But we should like to know what necessity there is to pay such a salary at all. There are plenty of good men to be had who could fill the post of secretary for £300 or so. The trust has one head man, Mr. John Dixon, the general superintendent, but yet, from the latest discussion, one might imagine this gentleman could not do his work. Could anything be more ridiculous or more insulting? The long and the short of the matter is the Swansea Harbour Clerkship is a nice little sinecure, like a parish with a big stipend and small flock, and the trustees don't like to have any alteration made.

The Swansea Harbour authorities are arranging to light the dock estate by means of electricity, not before time; their north dock has for years been a veritable death-trap of nights.

Monmouthshire trade is flourishing. It is stated that the chief iron foundries have orders in hand to last them for a considerable time ahead, and three of the leading iron companies have given orders for 250,000 tons of Spanish ore for delivery over the next nine months.

The good people of Cardiff are going in for limited companies with a vengeance. As we write this, James Tucker, Limited, is announced, and we are told to expect a limited concern to deal with biscuit baking. Then Swansea is to have a huge warehouse and milling scheme. At least, so the Swansea papers say, but poor Swansea swans are too often geese.

In our last "notes" we referred to the erection of some new patent fuel works at Barry. We since learn that they are being put up by the Crown Preserved Coal Co., of Cardiff.

It was stated, locally, a few days since that the Anchor Line proposed starting a service from Barry. This has been denied by Messrs. Henderson Bros. Another Welsh goose cooked.

Shipbuilding appears to have revived at Milford Haven. The early part of this month an iron steam ship was launched for Monsieur Delarue, of Dieppe. We hope that the new proprietors of the Milford yard will be more successful than were their immediate predecessors.

The coal trade is brisk, and it is difficult to secure any coal for shipment before the turn of the year. Due to the season, chartering is inactive. There are plenty of boats and plenty of freights, but the difficulty is to get the coals.

Tinplate makers continue holding out for higher prices, and the middlemen are beginning to see they will have to give up their attempts to bear the markets.

When the trade of the year comes to be reckoned up we scarcely think the actual results will work out quite so well as expected by some. Freights, for example, show an improvement, but when the figures are more closely gone into a considerable quantity of the gilt will be taken off the ginger-bread, for the increase in wages, price of stores and bunker coals will be found to be somewhat considerable. Then on coals, the men who have done best so far are the colliers. Prices have certainly risen, but there are yet a considerable number of colliery owners who have had old contracts to keep on with at prices which, if not meaning an actual loss, at least meant no profit.

## BELFAST TRADE NOTES.

THERE is no change in the state of trade here; matters are still the same; plenty of work in the engineering and shipbuilding business. Messrs. Harland & Wolff, Queen's Island, finished the s.s. *Nawab* during the past month, and have a sister ship, s.s. *Nadir* (launched as the *Bahadur*), almost ready for sea. Another, the s.s. *Gackwar*, to the order of the same owners, the Asiatic Steam Navigation Co., is ready for launching, and by the time our next month's report is due she will probably be ready for sea. The s.s. *Majestic* still keeps many hands busy; she will not be put on her station, we understand, until the beginning of the ensuing season. Whether she will show any improvement on her sister ship, the *Teutonic*, time will tell. She is in every way a duplicate of the former.

Messrs. Workman, Clark & Co. had a launch during the past month, and will have others to chronicle shortly.

Messrs. McIlwaine & Maccoll, Limited, have the s.s. *Andes* almost ready for sea. This steamer has received a most extensive overhaul to hull, and has also had new boilers and her engines converted to compound.

Messrs. Victor Coates & Co., Limited, have in hand engines for two steamers building by Messrs. Workman, Clark & Co.

This has been a very busy season for wooden ship repairers, Messrs. Hill & Robertson having been very busy the whole season, so much so that in some cases they were unable to undertake some work offered them.

The Harbour Commissioners are now receiving tenders for four steam cranes capable of lifting two and three tons. To the very energetic and thoroughgoing manner in which the Belfast Harbour Commissioners have managed their trust is due the rapid advancement of Belfast as a port, as every provision for the rapid discharge and loading of cargoes has been made, and few ports can boast a finer range of sheds than what are provided here for the cross-channel traffic. They have provided docks in advance of their trade, thus encouraging the trading of large steamers to this port. There is now a regular line from Baltimore. The quays are easily reached in all parts by the very extensive system of railways.

A new pier, about 700 ft. long, is about to be constructed at Bangor, the old one, owing to the rapid progress of this Irish Brighton, proving insufficient. During the past season the North of Ireland and Isle of Man Steamship Co. carried on a daylight service between Bangor and the Isle of Man by means of the fine paddle-steamer *Paris*, formerly on the Newhaven route.

The different manufactures in Belfast are in a healthy state, and during the past month or so a new industry has been commenced in the city, viz., hosiery, for which there should be a good opening.

The s.s. *China*, formerly of the Cunard Line, has, we understand, been purchased by Belfast owners, and is intended for general trading. She is now commanded by Captain Leahy, one of the proprietors.

## LEITH NOTES.

A VERY prosperous year has now drawn to a close, and the output from the various yards contrasts favourably with those of previous years. Several trial trips have taken place in the Firth of Forth during December, and four launches have occurred. The coal trade is practically at a standstill, owing to the collieries refusing to supply coal which is being binged as it comes up. The miners in the East and Mid-Lothian districts are discussing a further advance, but at a recent meeting they adjourned without any decision, the obvious reason being the lowness of the funds of the union.

The demand for Scotch pig iron for the Continent is unusually maintained for this season, and there are already enquiries for spring shipments. An order for 4,000 tons for shipment from Grangemouth to Stettin, delivery in March and April, has just been placed.

Four steamers have been launched in the Firth of Forth during December: two steamers, named the *Aud* and *Metrico*, by the Grangemouth Dockyard Co.; one, named the *Jacknar*, by Messrs. S. & H. Morton & Co., and one by Messrs. Ramage & Ferguson.

The total output for Leith this year has exceeded that of any previous year by over 4,000 tons, the largest previous to 1889.

being 13,722 tons, launched in 1883, while this year the total of 18,216 gross tons has been reached. To this record Messrs. Ramage & Ferguson contribute eight steel vessels and one caisson, with a total tonnage of 13,036 gross, and representing engines of 8,400 I.H.P. As will be seen, this in itself falls little short of the output for that prosperous year 1883. Messrs. Morton & Co. contribute six steel vessels of a total of 4,500 gross tons, with engines of 2,500 I.H.P., while Messrs. Hawthorn & Co. have two steel barges of 680 gross tons and 500 I.H.P. The tonnage still in hand is exceedingly high, Messrs. Ramage & Ferguson having five vessels still to build; Messrs. Morton & Co. have also five vessels of a tonnage of about 4,500 gross, and Messrs. Hawthorn & Co. have about 900 tons gross.

At Grangemouth the output is proportionately increased. That enterprising firm, the Grangemouth Dockyard Co., have placed in the water 14 steel vessels of a total of 14,047 gross tons, and 5,200 I.H.P. When it is considered that the largest previous output was last year, when 4,556 tons were launched, the growth of trade here may be understood. This company has also 8,000 tons gross under construction in their yards at Grangemouth and Alloa.

The trawling industry has during the past 12 months been very profitable, and is in a prosperous state.

Several owners of trawling vessels in Aberdeen have lately placed orders with builders for five new steamers of the most improved type, while Messrs. Hawthorn & Co., Leith, are about to lay down the keel for a powerful new trawler for Mr. Thomas Devlin, Newhaven, and in the middle of December the General Steam Fishing Co., Limited, purchased, through Mr. Andrew Hewat, ship and yacht broker, Granton, the screw steamer *Isabella*, of Ardrrossan, which was built about two years ago by the Marquis of Ailsa, at Culzean, from designs by Mr. W. Fife, jun., and under special survey to Lloyd's highest class.

In the beginning of the month the Dundee Shipowners' Co. purchased from Messrs. Russell & Co., Port-Glasgow, a splendidly-modelled four-masted steel sailing vessel nearly ready for launching. The ship, which is of 2,600 tons register and 4,100 tons deadweight capacity, will be the largest sailing ship hailing from Dundee by fully 1,000 tons. Mr. W. S. Courdace, also of Dundee, has purchased a sailing barque of 2,000 tons, at present being built at Dysart. The vessel is to be named the *Orion*.

At the annual meeting of the Dundee Seal & Whale Fishing Co., held on the 20th December, a dividend of £5 per share was declared.

The Dundee Harbour Trustees have raised an action against the North British Railway Co. to have them ordained to exhibit and keep burning, from sunset to sunrise, lights on the old Tay bridge, now being raised from the bed of the river, or in default to allow the Harbour Trust to do so at the expense of the Railway Co.

A revival of shipbuilding is anticipated at Garmouth. Time was when Garmouth, and its attendant port of Kingston, was well known in every quarter of the globe for producing wooden vessels of the finest build and finish. Some five years have now elapsed since the sound of the carpenter's mallet has been heard, but Mr. Geddie, a shipbuilder of forty years' standing, will, in the beginning of 1890, lay the keel for a vessel of 130 tons burden at his yard, the Hillock.

The Brush Electric Lighting Co. have secured the whole of the arc lighting for the International Exhibition, to be held in Edinburgh, in 1890. The installation will consist of 350 arc lamps, of 2,000 nominal candle power each, run in series from Brush dynamo machines.

## ELECTRICITY IN THE ENGINE-ROOM.

By FREDERICK WALKER, M.S.E.

THE measurement of potential, or electro-motive force, is effected by means of a voltmeter, which is actually a galvanometer with coils of fine wire of high resistance, and an index and scale, the latter being graduated so as to give by direct reading the value in volts of the potential or electro-motive force that is desired to be measured. A voltmeter is placed as a shunt between two given points of an electrical circuit, as shown by the diagram, Fig. 1, in which *a* is the generator, *b* and *b'* the positive and negative leads respectively. In order to avoid undue heating of the fine wire forming the coils of the voltmeter, *v*, a key, *c*, may be advantageously inserted in the shunt, so that contact may be made and main-

tained only while taking a reading of the instrument. A voltmeter actually measures the strength of the current passing through the shunt; but, when the total working resistance of the circuit probably does not exceed 5 ohms, and the coils of the voltmeter have a resistance of 5,000 ohms, it will be seen that though the deflection is due to the current flowing round the coils, this current is infinitesimal compared to the total current flowing round the main circuit; therefore, for all practical purposes, we may assume that the reading is directly proportional to the potential or electro-motive force. In order to render this perfectly clear, we may imagine that a certain number of ampere turns upon the coil or coils of a measuring instrument produces a given deflection *a*, by reason of the magnetic action. Ampere-turns may be stated as

current in amperes  $\times$  turns of wire; therefore, for example, we will suppose that the coil of an electro-magnet be wound with 100 turns of insulated wire, and that 10 amperes be passed through it. Now the magnetic effect of this current upon the iron core of the coil is due to  $10 \times 100 = 1,000$  ampere turns, and, allowing a certain definite movement, such as the deflection of a needle, to be produced against the torsion of a spring or other similar mechanical resistance, the result may be stated thus:— $10 \times 100 = 1,000$  ampere turns = *d*;—and now, taking the case of another coil, with 10,000 turns of finer wire, and 0.1 ampere current flowing, the result is yet the same, viz.:— $10,000 \times 0.1 = 1,000$  ampere turns = *d*.

It is, therefore, apparent that the magnetic effect of a coil, and consequently the deflection of a needle, is due to the number of turns of wire  $\times$  the current flowing round them; hence, if a coil of great resistance, relatively to that of the external circuit, be placed as a shunt, so as to deflect the needle of a measuring instrument, it is evident that the degree of deflection, although due to current, is yet due to a very small current; and further, taking into consideration the fact that the flow of current through any resistance is due to the potential, or electrical pressure at the extreme points thereof, it is clear that any deflection of a needle and index caused by the magnetic action of a coil of very high resistance, must be directly proportional to the potential or electro-motive force, at the points of attachment of the shunt.

There are many different types of voltmeters now in general use, but all are not suited for marine installations, such for instance as those in which the vibration and oscillation of the ship renders the reading defective, or in which permanent magnets are employed, requiring frequent and accurate calibration, a process that cannot be conveniently carried out periodically during a voyage. In cases where the permanent magnets are replaced by suitable electro-magnets, it is essential that the conditions shall allow of the magnetic saturation of the iron core by a much smaller current than is required to deflect the index, so that the electro-magnet is constant with regard to its directive influence upon the needle irrespective of any increase or decrease of current. Spiral springs, and other similar devices, are employed by various instrument manufacturers to render the voltmeters and ammeters "dead beat" in action, and also to cause them to indicate correctly, independently of external movements or vibration. The Cardew voltmeter is a distinct departure from the principles of those above referred to, inasmuch that magnetic action is dispensed with, and the deflection of the needle or index is obtained by means of the linear expansion of a length of fine wire of high resistance, which is, of course, proportional to the current passing through it, and, as the total resistance of the instrument is very high, the deflection indicates potential, or electro-motive force, when inserted as a shunt in a circuit.

The measurement of current is effected by means of an ampere meter, generally termed an "ammeter," which is similar in appearance and construction to the voltmeter, with the exception that the deflecting coil is wound with a strip or strips of copper, suitably insulated; instead of fine wire of high resistance. The resistance, therefore, of an ammeter being so small as to be negligible, and consequently no danger to be apprehended from over-heating, the instrument may be placed in "series" in the circuit, and the whole current may continuously pass through it, as shown by the diagram, Fig. 2, where *C* represents the ammeter, *E* the voltmeter, and *R* a certain resistance, such, for instance, as an incandescence lamp; *a* being the generator, and *b b'* the  $+$  and  $-$  conductors respectively.

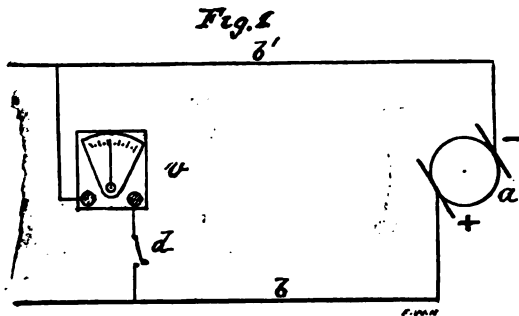
According to Ohm's law, relating to the values of *E*, *C*, and *R*, in volts, amperes and ohms, two being ascertained by

measurement, the third may be estimated by computation, thus:—

$$\begin{aligned} \frac{E}{C} &= R \\ \frac{E}{R} &= C \\ R \times C &= E \end{aligned}$$

therefore, referring to the diagram, Fig. 2, and supposing the reading of the voltmeter to indicate  $E = 60$ , and that the ammeter similarly indicates  $C = 0.75$ , we have  $\frac{60}{0.75} = 80$ , we find that  $R = 80$  ohms. If  $R$  were a known resistance, say 50 ohms, and the ammeter indicated that a current of 1.5 amperes was passing, and we wished to estimate the value of  $E$  in volts without the voltmeter,  $R \times C = 50 \times 1.5 = 75$  volts.

There are many methods of measuring resistances; the use of the Wheatstone's bridge being the most convenient and accurate, and generally adopted. An instrument termed an Ohmmeter, first invented and perfected by Professors Ayrton and Perry, also serves the purpose admirably, but does not at present form any part of the electrical outfit provided in the Mercantile Marine, although in my opinion, far more suitable for the peculiar requirements of engine-room installations than is the more complicated Wheatstone's bridge. However, neither of these instruments are capable of accurate reading when the ship is in motion; but it is quite necessary that the person in charge of a marine installation should possess appliances for properly testing his apparatus from time to time, when in port. The ohmmeter admits of direct reading, the scale being graduated so that the value of  $R$  may be read in ohms. There are two coils in this instrument, placed with their axes at right angles to each other, one wound with thick



wire, and placed in "series" so as to take the main current, and the other wound with fine wire, of high resistance, placed as a shunt to the first coil. A magnetic needle is pivoted, and connected to the index in such a manner as to be acted upon by the currents in each coil, and the resulting deflection is therefore proportionate to  $\frac{E}{C} = R$ . The greatest accuracy in designing, and setting out the relative dimensions and windings of the coils and needle, is, of course, necessary, in order that such an instrument may be reliable.

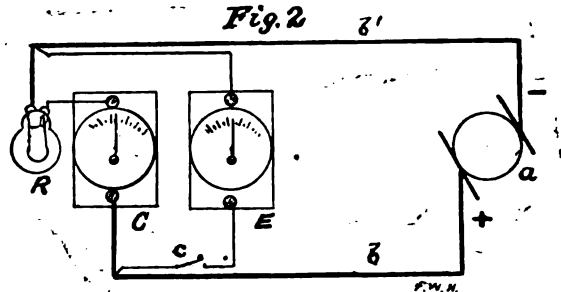
The theoretical Wheatstone's bridge is shown by the diagram, Fig. 3, in which A, B and C, are arms in which a number of coils of known resistance are fitted so as to be either included as resistances in the arm, or cut out as may be desired. R is the resistance to be measured, C is the sensitive galvanometer, with a spring key  $k$ , and B a constant battery. The resistances in the arms A, B and C are unplugged until the depression of the key  $k$  causes no deflection of the galvanometer C. It is then evident that the relative values of the resistances of A R and B C are proportional, and represented by the ratio:

$$A : B :: C : R \text{ or } R = \frac{C \times B}{A}$$

The arms of the bridge generally employed for the measurement of resistance are placed upon the cover of a rectangular case or box, and suitable terminals are provided for coupling the galvanometer and battery in the proper places, and sometimes these are permanently attached to the case and connected ready for use.

Electrical power, or energy, may be computed by the formula  $E \times C = W$  in watts, or volt-amperes, using a voltmeter and an ammeter in the manner shown by Fig. 2. In this case, we will suppose the ammeter to indicate 15 amperes, and the volt-

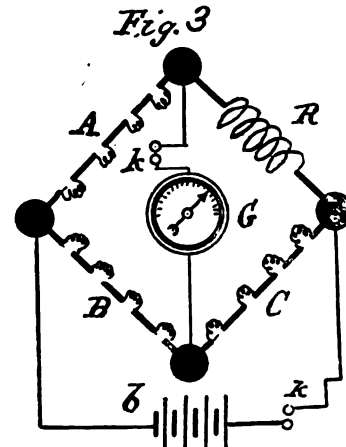
meter a potential of 100 volts, the value of  $E$  and  $C$  respectively, then  $W \times 15 = 100 = 1500$  watts, or, in other words  $\frac{1500}{746} = 2$  EHP, nearly, as 746 watts represent one electrical H.P. Messrs. Ayrton and Perry, have devised a Power-meter, in which the readings may be directly taken in watts two coils are provided, as in the case of the ohmmeter; the shunt, or fine wire coil, however, being suspended, the axes of both coils arranged so as to be parallel when the index points to zero, and no current is passing. The deflections are therefore directly proportional to  $E \times C$ , and consequently the power or energy is indicated in watts. In 1885, I made and patented a recording, or registering wattmeter, in which a



suspended solenoid, wound with fine wire, coupled as a shunt to the main circuit, is drawn into a larger solenoid, wound with thick wire, through which the main current passes. A carefully-balanced spiral spring is placed so that the descent of the shunt solenoid is regulated by its torsion, and a suitable lever provided with a stylus, and moved by the shunt solenoid, describes a curve upon a card, carried by a drum, which revolves by means of clockwork. The power or energy passing through the circuit in a given time, may thus be read in watts hours. This instrument is especially applicable to the processes of "forming" and "charging" accumulators, for which purpose it was really designed and employed.

The calibre of dynamo-electric generators is, according to modern practice, stated in "units" or "kilowatts," the value of which may be given in other terms,

$$\begin{aligned} 1 \text{ kilowatt} &= 10^{10} \text{ ergs.} \\ \text{or} &= 1,000 \text{ watts.} \\ \text{unit.} &= 44,220 \text{ foot pounds.} \\ &= 1.34 \text{ horse power.} \end{aligned}$$



thus, a machine with an output of 30 amperes, at a potential or pressure of 100 volts, would be termed a 3-unit or 3-kilowatt machine. The total electric energy of any description of dynamo may be estimated in the following terms:—

$$W = \frac{E \times C}{746} = \text{horse power.}$$

$$W = \frac{E \times C}{736} = \text{chevaux-vapeur.}$$

or,

$$W = \frac{E \times C}{9.81} = \text{kilogrammetres per second.}$$

but it must be remembered that any electrical resistance inter-

posed in a circuit absorbs electrical energy, and as no machine can be designed or made in which there is no resistance, it is evident that the useful or available energy is somewhat less than the total energy above mentioned. This loss may be calculated when the machine is working, by taking the electro-motive force at the extreme ends of the main leads nearest to the dynamo, and also interposing the ammeter so that the whole current passes through it. Or, knowing the total resistance  $R$  of the armature and field magnets of a series wound dynamo when hot, the energy absorbed may be estimated thus :

$$\frac{C^2 R}{746} = \text{E.H.P. loss,}$$

and of a shunt-wound machine, the potential may be ascertained at the terminals of the shunt coils, and if the resistance of these be  $R_s$ , the magnetising current will be—

$$\frac{E}{R_s} = C_s$$

and the loss in the shunt coils—

$$\frac{C_s^2 R_s}{746} = \text{E.H.P.} = I_s$$

and the loss in the armature, its known resistance being  $R_a$ , and the total current  $C_t = C + C_s$  where  $C$  is the available current, and  $C_s$  that portion absorbed by the shunt, is—

$$\frac{C_t^2 R_a}{746} = \text{E.H.P.} = I_a$$

the total loss,  $L = I_s + I_a$ .

As an example of this method, we may suppose that it is required to estimate the energy absorbed by an incandescence lamp, where we have found, by placing a voltmeter as a shunt across its terminals, a potential or electro-motive force of 110 volts, and an ammeter inserted into the circuit indicates the passage of a current of 0.6 ampère. Then, as  $\frac{E \times C}{746} = \text{HP}$ , we find that  $\frac{110 \times 0.6}{746} = 0.088 \text{ HP}$ , the energy expended in the lamp. The resistance  $R$  of the lamp may be calculated from  $\frac{E}{C} = R$ , or  $\frac{110}{0.6} = 183 \text{ ohms}$ , and we now have the requisite data to prove the first method by the second, thus :

$$\frac{C^2 R}{746} = \text{HP.}, \text{ therefore } \frac{0.36 \times 183}{746} = 0.088$$

horse-power as before.

In this manner any work performed in the circuit, whether useful work or waste, may be calculated and expressed in suitable terms.

Some years ago, a certain railway magnate expressed the opinion openly at a public meeting, "that the less locomotive drivers knew about the construction and theoretical efficiency of their engines away from the foot-plate, the better, so far as concerns their ability as drivers." This is certainly a startling theory, and although the gentleman in question may have found it to work well in his especial practice, it certainly would not equally apply in every case. A locomotive is put into the sheds daily, and overhauled by competent engineers, while the still more costly marine-engine may nearly circumnavigate the globe, and need no repair beyond that afforded by the resources of the engine-room, simply because the engine-driver and engine maker in this case are identical, and the more intimately the engineers are acquainted with the machine in their charge, the more efficient is the performance of their duties. This should also be the case with the electrical installations on board ship, for although a dynamo is such a simple piece of mechanism that any ordinary winchman can drive it, yet the supervision of a man who thoroughly understands it, in principle and detail, and who can foresee, and rationally prevent, a breakdown, is necessary for efficient maintenance and successful working during a long voyage. This has become of late within the range of the duties of the marine engineer, and we may look, in the immediate future, for the establishment of an electrical section, comprised in the syllabus of the Board of Trade Examination, with, probably, the grant of an extra certificate to those who successfully master the subject.

THE directors of the Naval Construction and Armaments Co. have decided to pay an interim dividend at the rate of six per cent. per annum on the 31st inst.

SHIPBUILDING CONTRACT.—Messrs. Fleming & Ferguson, engineers and shipbuilders, Paisley, have received an order from Mr. F. R. Wood, New South Wales, to build for him a steel steam yacht, of about 450 tons yacht measurement. She is to be fitted by the builders with a set of their patent quadruple-expansion engines to indicate about 1,000 horse-power.

## Reviews.

*The Specialists' Series; Hydraulic Motors, Turbines, and Pressure Engines.* By G. R. Bodmer, A.M.Inst.C.E. (London: Whitaker & Co., Paternoster Square.)

We have before us the above text-book which appears to be one of a series of Specialists' text-books to be presented to the various branches of the professional world as standard guides in various special departments. We compliment the publishers on the selection of a special subject in this particular book, of which little is generally known, viz., that of Hydraulic Motors, including Turbines and Pressure Engines. Turbines have been practically almost a *terra incognita* to the engineering profession; those who have any intimate knowledge thereof having been almost entirely restricted to scientific professors and a very few specialists engaged in that line of construction. In the letterpress we find that, very properly, the author commences with definitions as to the conditions of realisation of water-power and with the general application of water-pressure to turbines. Many clear and various illustrations are given of various typical turbines, such as re-action turbines, inward-flow turbines, and outward-flow impulse turbines. These examples are followed by close analysis of the theory of such turbines expressed in algebraical and trigonometrical equations. These mathematical expressions do not seem to be unnecessarily complicated, though they may afford but little assistance to solely practical readers. However, it is an undoubted fact the theoretical conditions of such hydraulic appliances as turbines cannot be satisfactorily solved without a sufficient facility in the understanding and use of mathematical formulæ; at the same time, the author has very sensibly endeavoured in the letterpress to describe the principles and examples in such a way as to impart, as far as possible, a general knowledge to practical men who may not be competent to follow the work through its mathematical expressions. Many good points of practical advice are given to manufacturers as to points of construction, and the effect of relative proportions and dimensions are gone into in great detail as determining the best designs for special turbines. Many tables of experimental results on the flow of water, and compiled statements of the dimensions of certain designs of turbines are given, and should be of great practical value. A considerable section of the end of the book is devoted to hydraulic pressure engines. In conclusion, we would say that this is the best text-book we have seen upon a little-known subject, viz., that of turbines of various types, and that every credit is due to the enterprise of the publishers and to the excellent manner of production, as regards type and illustrations, which are beautifully clear and intelligible.

THE Admiralty have entered into a contract with Messrs. Humphrys, Tennant & Co. to supply additional machinery for the *Royal Sovereign*, *Hood*, and *Repulse*, the new armour-plated ships under construction at Portsmouth, Chatham, and Pembroke. The new machinery for these vessels includes steering engines, air compressors, boat-hoisting engines, and the electric light.

SIX NEW ATLANTIC GREYHOUNDS.—There are now six fast steamers building which will press the *City of Paris*, of the Inman Line, very hard in keeping her position as the champion racer of the ocean. The Hamburg-American Line, whose twin propeller, the *Columbia*, made a new record of 6 days 18 hours and 10 minutes to Southampton on November 14th, will have a magnificent new twin-screw ship running in May next. She is to be called the *Normania*, and is now building at the yard of Messrs. John Elder & Co., the constructors of the *Etruria* and *Umbria*. The *Normania* is a little smaller than the *City of Paris*, being 520 ft. long, with 59 ft. beam, and 38 ft. depth of hold. She will have 16,000 indicated horse-power. She will be launched in March next. The keel of her sister ship is being laid by the Vulcan Shipbuilding Company, Stettin. This vessel will not be ready to run until the spring of 1892. She will be called the *Venetia*. The French Line also has a big twin-screw ship on the stocks, which will probably be running next summer. She is to be called the *Touraine*, and is to be several thousand tons larger than any of the fine single-screw ships of the French line which hold the record between New York and Havre. The White Star steamship *Majestic*, a sister ship to the *Teutonic*, will be ready to do battle with the *City of Paris* next spring. The Cunard Line will also put two twin-screw boats in the field to win back the lost laurels of the *Etruria*. Their names have not been selected. They will be powerful ships, and will take the place of the *Servia* and the *Aurania*, which will do duty between Liverpool and Boston.—*Iron*.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES.—ENGLISH.

**Caledonia.**—On November 21st there was launched from the shipbuilding yard of Messrs. Joseph L. Thompson & Sons, at North Sands, a steel screw steamer of the following dimensions, viz.:—Length, 316 ft.; breadth, 40 ft. 6 in.; depth, 21 ft.; having a deadweight carrying capacity of 4,200 tons; built to the order of the International Line Steamship Co., Limited, of Whitby. This vessel is built on the web-frame and longitudinal plate intercostal system, and is of the highest classification at Lloyd's. Water-ballast tanks are fitted fore and aft on the cellular double-bottom principle, and the holds are subdivided by six watertight bulkheads. The engines are of the triple-expansion type, having three cranks, and have been built by Mr. John Dickinson, of Palmer's-hill Engine Works. They are of 1,200 I.H.P., having cylinders 23.5 in., 38 in., and 62 in. respectively, with a stroke of 42 in. Two steel boilers will be supplied, having a working pressure of 160 lbs. to the square inch. The ceremony of naming the vessel *Caledonia* was performed by Mrs. C. Swainson, of Manchester, wife of one of the directors of the International Line Steamship Co.

**Cheriton.**—On November 22nd Messrs. John Priestman & Co. launched from their shipbuilding yard, at Sunderland, a steel screw steamer. Length, 240 ft.; extreme breadth, 32 ft.; depth, moulded, 16.4 ft. She is built to the order of Messrs. T. P. Richards & Co., Swansea, and is of the raised quarter-deck type, with long bridge extending to forward of the foremast, and is schooner-rigged. The engines have been built by Messrs. W. Allan & Co., Scotia Engine Works, Sunderland, and are of the triple-expansion type, of about 700 I.H.P. There are two boilers, having a pressure of 160 lbs. The vessel was named the *Cheriton*.

**Ville du Havre.**—On November 23rd there was launched from the yard of Mr. James Laing, Sunderland, a handsome spar-decked steamer, built to the order of the Compagnie Havraise Peninsulaire de Navigation à Vapeur, of Havre. The steamer is of the following dimensions:—Length, 339 ft.; breadth extreme, 41 ft.; depth, moulded, 29 ft. 2 in., with bridge deck and topgallant forecastle. The vessel is classed 100 A 1 at Lloyd's, also in Veritas' first division. The machinery has been made by Messrs. George Clark, Limited, the diameters of the cylinders being 24½ in., 40 in., and 66 in., with 45 in. stroke, and double-ended boilers, 160 lbs. pressure. The vessel was named *Ville du Havre*.

**Boldon.**—On November 23rd there was launched from the yard of Messrs. Wood, Skinner & Co., Bill Quay, Newcastle-on-Tyne, a fine iron screw steamer, which has been built to the order of Messrs. Wm. Swanston & Sons, Quayside, Newcastle-on-Tyne. The principal dimensions are:—Length, 246 ft.; breadth, 33 ft.; depth, 17 ft. 6 in., moulded, with a deadweight carrying capacity of 1,760 tons. The vessel is of the well-deck type, with poop, raised quarter-deck, bridge, and topgallant forecastle. She is built on the cellular-bottom principle, with arrangements for water ballast throughout. The cabins are in the poop aft, and accommodation is provided for the engineers and officers under the bridge amidships. She is fitted with Donkin & Nichol's steam steering gear amidships, and Hastie's screw gear aft, and has Emerson & Walker's patent windlass on topgallant forecastle. She has been built under Lloyd's survey for the highest class, and has been superintended during construction by Mr. C. A. Bushell, of Newcastle. The engines have also been built to Lloyd's requirements by the North-Eastern Marine Engineering Co., Limited, Wallsend. They are on the triple-expansion system, having cylinders 18½ in., 30 in., and 49 in., and a stroke of 33 in., capable of indicating 750 H.P., and driving the vessel at a speed of 10 knots loaded. She was named the *Boldon*, the christening ceremony being performed by Miss Swanston, the daughter of the managing owner.

**Lady Tennant.**—On November 23rd there was launched from the Howden yard of Messrs. Palmer & Co. a steel screw steamer of the following dimensions:—Length, 285 ft.; breadth, 39 ft.; depth, 21 ft. 4 in. The vessel is to be rigged as a two-masted schooner of the well-deck type, and will carry over 3,000 tons. The vessel, which is intended for the general cargo trade, was built to the order of Messrs. Scott Brothers, of Newcastle. She was named the *Lady Tennant*.

**Ruby.**—On November 23rd there was launched from the building yard of Messrs. Lee and Wight, of Tweedmouth, a wooden screw steamer, built to the order of Messrs. J. S. Forrest & Co., of North Shields, and intended for the deep-sea fishing off the Tyne. She was named the *Ruby* by Miss Lily Forrest.

**Æon.**—On November 25th Messrs. Ropner & Son launched at Stockton a steel screw steamer, named the *Æon*, and built to the order of Messrs. Newman & Dale, of Newcastle-on-Tyne, her dimensions being as follow:—Length over all, 282 ft. 6 in.; breadth, 38 ft. 10 in.; depth, moulded, 21 ft. 11 in. She will take the highest class at Lloyd's, and is designed to carry 3,300 tons dead-weight. She has a short poop containing a handsome saloon with accommodation for captain and officers, raised quarter-deck, long bridge extending to foremast, short well, and topgallant forecastle; cellular bottom for water ballast, and four steam winches, steam windlass and steam steering gear. Being built on the web-frame principle, her holds are quite clear, and will give large stowage for cargo. Her outfit includes all the latest appliances for rapid loading and discharging. She will be fitted with triple-expansion engines by Messrs. Blair & Co., of 900 I.H.P., and two large steel boilers working at 150 lbs.

**Steel Coaling Lighters.**—On November 25th Messrs. Ed. Finch & Co., Limited, launched from their shipyard at Chepstow, three more of the 150-ton steel coaling lighters, built to the order of the Lords Commissioners of the Admiralty.

**Pochard.**—On November 25th Messrs. Cochrane, Cooper & Schofield launched from their Shipyard, at Grovehill, Beverley, the second of an order of steam trawlers built for the Liverpool Steam Fishing Co. The vessel was christened the *Pochard* by Miss Cochrane. The dimensions of the trawler are as follows:—Length, between perpendiculars, 100 ft.; beam, 20 ft. 3 in.; depth of hold, 11 ft. She is classed 100 A 1 at Lloyd's. Her driving power will be supplied by 45 H.P. triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull.

**Kilmore.**—On November 25th there was launched from the yard of Messrs. Edward's Shipbuilding Co., Limited, Howden-on-Tyne, a steel screw steamer, named the *Kilmore*, built to the order of Messrs. W. Johnston & Co., of Liverpool, for the Mediterranean and Black Sea trades, of the following dimensions:—Length, 297 ft.; breadth, 38 ft.; depth, 19 ft. 6 in. She is built under Lloyd's special survey to obtain their highest class, 100 A 1, on the well-deck rule. Large and powerful engines will be placed in the steamer by Messrs. David Rollo & Sons, Liverpool.

**Greyhound.**—On November 27th there was launched from Messrs. Cook, Welton & Gammell's yard, at Hull, a steam trawler, built to the order of the Humber Steam Trawling Co. The vessel, which was christened the *Greyhound*, is the twelfth built for the same firm, and is sister ship to the *Deerhound*, which went on her trial trip on Saturday last. She is 100 ft. long; 20 ft. 9 in. in breadth; and 11 ft. deep in the hold. She will be engined by Messrs. Bailey & Leatham.

**Ovingdean Grange.**—On November 29th Messrs. Raylton, Dixon & Co. launched from their Cleveland Dockyard, a steel screw steamer which has been built to the order of Messrs. Houlder Bros. & Co., London, under the inspection of Messrs. Flannery, Baggallay & Johnson. The vessel is built on the "partial awning deck" rule, having long bridge extending to forecastle, and is generally fitted as a first-class cargo boat. Her dimensions being length over all, 307 ft.; breadth, 40 ft.; depth, moulded, 21 ft. 4 in.; with a deadweight capacity of about 3,500 tons. Her engines will be fitted by Messrs. Thomas Richardson & Sons, Hartlepool, with cylinders, 23 in., 37 in., and 61 in. by 42 in. stroke, and three extra large boilers, so as to supply refrigerating machinery with which she will be fitted for the dead meat trade. The vessel was named the *s.s. Ovingdean Grange*.

**Cornubia.**—On November 29th Messrs. W. Gray & Co., Limited, launched the fine steel screw steamer *Cornubia*, which is of the following dimensions, viz.:—Length over all, 270 ft.; breadth, 36 ft. 6 in.; depth, 19 ft. 5 in.; of 2,550 tons dead-weight capacity, and built to the order of Mr. Richard B. Chelwell, of Truro. The vessel, which will take Lloyd's highest class, is of the well-decked type, with a poop having saloon and cabins for officers and a few passengers; a raised quarter-deck, joining a long bridge, which is of extra strength,

carried right up to fore-hatch, and containing comfortable quarters for the crew at the fore end, and the engineers at the aft part. The usual topgallant fore-castle is fitted with Emerson, Walker & Co.'s patent windlass. The hull is built on the web-frame principle, dispensing with hold beams, and giving a clear hold for working cargo. Five hatches are fitted, four steam winches, steam steering gear amidships, and screw gear aft, donkey boiler, double-bottom under each hold for water ballast; smart fore-and-aft schooner rig. The boats carried on beams overhead, and a complete equipment provided for general trading. Fine triple-expansion engines of 750 H.P. and two steel boilers to work at 150 lbs. pressure per square inch, are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. The *Cornubia* is the fourth ship built by Messrs. W. Gray & Co., Limited, for Mr. Richard B. Chellev, and is sister ship to the *Duke of Cornwall* and the *Duchess of Cornwall*.

**Grecian Prince.**—On December 4th Messrs. Short Bros. launched from their shipbuilding yard, at Pallion, a steel screw steamer, to the order of the Prince Steam Shipping Co., Newcastle-on-Tyne. The following are her dimensions:—Length, 290 ft.; breadth, 39 ft.; depth, moulded, 21 ft. 2 in. The vessel is constructed under special survey to the highest class for steel at Lloyd's registry. She was named *Grecian Prince* by Miss Short, daughter of the builder. The engines, which are to be fitted by Mr. John Dickinson, of Sunderland, are of 200 H.P., on the triple-expansion principle, having two steel boilers.

**Dieppols.**—On December 4th there was successfully launched from Messrs. T. R. Oswald & Co's., Limited, works, a steel cargo steamer built for M. Delarue, of Dieppe. The following are her principal dimensions:—Length over all, 248 ft.; breadth, extreme, 32 ft. 6 in.; depth, 19 ft. 3½ in.; and 1,800 tons dead-weight. The vessel is built on the web-frame principle with single deck to Lloyd's and Bureau Veritas' highest class. Water ballast in cellular bottom all fore and aft and in after peak. She has short poop bridge and fore-castle, three large cargo hatchways with three powerful winches by Clarke, Chapman & Co. (one being double-barrelled) for the rapid discharge of cargo, and is schooner-rigged with pole-masts. The steering arrangement of the vessel consists of one of Higginson's Steam Quartermasters on the bridge, and a powerful screw gear on the poop. The main engines are of the triple-expansion type, with cylinders 17 in., 28 in., and 47 in. diameter by 30 in. stroke, supplied by steam from two large single-ended steel boilers, working at 160 lbs. pressure per square inch. As the vessel left the ways she was gracefully named the *Dieppois* by Madame Delarue, wife of the owner.

**Sandfield.**—On December 5th Messrs. Edward Withy & Co. launched from their yard, at Hartlepool, a large steel screw steamer, built to the order of F. Woods, Esq., London. She is a vessel measuring about 290 ft. in length constructed throughout of Siemens-Martin steel, and built to the highest class at Lloyd's. The vessel has a long raised quarter-deck, long bridge house and topgallant fore-castle. The holds are fitted with iron grain divisions and iron cargo battens; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after holds the vessel is built on the web-frame system, which gives a very strong type of ship and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and aft for water ballast and the after peak is also available for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey boilers, steam steering gear amidships, screw gear aft, windlass on fore-castle deck, and patent stockless anchors hauling up into hawse pipes. The saloon and cabin, providing accommodation for the passengers, captain and officers, is handsomely finished in polished hardwood, with neatly-painted panels executed in a very effective style by the decorative staff of ladies employed by the firm. The vessel will be rigged as a two-masted fore-and-aft schooner with steel pole-masts, and all cargo appliances for expeditious handling of cargo. The vessel will be fitted with triple-expansion engines and one large double-ended boiler by Messrs. Blair & Co., Stockton-on-Tees. The hull and machinery have been constructed under the personal supervision of Mr. Sage, of London. On leaving the ways the vessel was gracefully christened *Sandfield* by the Mayoress of Hartlepool, Mrs. Henry Withy.

**Charters Tower.**—On December 7th the largest steamer yet built at South Shields was launched from the yard of Messrs. J. Readhead & Sons, of that town. She has been built to the order of Messrs. J. Stumore & Co., of London, is a vessel of 4,300 tons deadweight capacity, and was named the *Charters Tower*.

**Camperdown.**—On December 7th Messrs. John Blumer & Co. launched from their yard, at Sunderland, the steel screw steamer *Camperdown*, built to the order of Messrs. Pinkney, Son & Clare, London, of the following dimensions:—Length, 250 ft.; breadth, 37 ft.; depth, 18 ft. 10 in. The vessel when complete is to take the highest class at Lloyd's. The engines and boilers are built by Messrs. Alley & McLellan, Glasgow. Cylinders 18 in., 30 in., and 48 in., with 36 in. stroke; two steel boilers working at a pressure of 160 lbs.

**James Spier.**—On December 7th there was launched by Messrs. R. Craggs & Sons, from their castle moat shipyard, Stockton-on-Tees, an iron steamer of the following dimensions:—Length over all, 173 ft.; breadth, 26 ft.; depth, moulded, 12 ft. 11 in. She is built to the order of Messrs. Pile & Co., London, who have sold her to Messrs. Lancaster, Spier, & Co., colliery owners, Newport, Mon. She will be fitted by Messrs. E. Scott & Co., Newcastle-on-Tyne, with triple-expansion engines, having cylinders 12, 20 and 30 in. by 24 in. stroke. She was named the *James Spier*.

**Barola.**—On December 7th there was launched from the shipbuilding yard of Messrs. S. P. Austin & Son, Sunderland, a screw steamer of about 1,460 tons gross register, constructed of Siemens-Martin mild steel, under special survey, to class 100 A 1 at Lloyd's, designed to carry a large deadweight cargo on a light draught of water. The machinery (of the triple-expansion type) will be fitted by Mr. John Dickinson, Sunderland, to indicate about 700 H.P. The vessel was named the *Barola*.

**Nord.**—On December 7th there was launched from the shipbuilding yard of Messrs. Barclay, Curle & Co., Limited, Whiteinch, a four-masted sailing ship of 3,200 tons gross register, built to the order of Ant. Dom Borde et Fils, Paris. Her dimensions are:—348 ft. by 46 ft. 6 in. by 30 ft. Her carrying capacity is 5,000 tons. She has been constructed in accordance with the requirements of Lloyd's and French Veritas for highest class in both registers, and is intended for the nitrate trade between Spanish-American ports and France. The vessel was named the *Nord*.

**Maori.**—On December 7th Messrs. C. S. Swan & Hunter, of Wallsend, launched a steel screw steamer for the line of the Shaw, Savill & Albion Co., Limited, of London, for their dead meat carrying trade, between the Antipodes and the British Isles. The vessel is built to Lloyd's highest class on the three-deck rule, with long poop, long bridge amidships, and topgallant fore-castle, the accommodation for officers, engineers, and captain being all under the bridge deck, leaving the poop for cargo. The dimensions of the vessel are:—324 ft., between perpendiculars; breadth, extreme, 40 ft.; and depth, moulded, 25 ft. 9 in. The engines are 26 in., 42 in., and 69 in. by 45 in. stroke, driven from two large boilers working at 160 lbs. pressure, and built by the Wallsend Slipway & Engineering Co., Limited, of Wallsend. The vessel is being built under the survey of the company's superintendents, Captain M'Kirby and Mr. Carrick, consulting engineers, and was christened *Maori* by Miss Brown.

**Drummond.**—On December 7th there was successfully launched from the yard of Messrs. Robert Thompson & Sons, Southwick, Sunderland, a steel screw steamer, built to the order of Messrs. Gillison & Chadwick, of Liverpool. Her dimensions are:—Length, 337 ft.; breadth, 42 ft.; depth, moulded, 27 ft. 3 in. Class 100 A 1 at Lloyd's and is constructed on the three-decked rule, designed to carry a large cargo on a light draft of water. She is built with a cellular double bottom for water ballast, main deck is of steel and upper deck of iron, covered with yellow pine, large hatchways, four horizontal steam winches, two donkey boilers, steam windlass and steering gear. Accommodation is provided in the fore-end of the bridge for captain and a few passengers, with entrance from house on bridge deck. Engineers and officers are berthed at after-end of bridge. The sailors and firemen have their accommodation in the poop aft, lamp-rooms, &c., being fitted up under topgallant fore-castle. The engines are supplied by J. Dickinson, Esq., of Sunderland, having cylinders 24½ in., 40 in., and 66 in. by 45 in. stroke, with two very large double-ended boilers of 160 lbs. pressure. The vessel during her construction has been overlooked by Mr. H. H. West, consulting engineer, and Captain

Chubb, superintendent for the company. As the vessel left the ways she was gracefully christened the *Drummond* by the wife of Captain Chubb.

**Hernley Grange.**—On December 7th this vessel was launched by Messrs. Wigham, Richardson & Co., of Newcastle. She is 300 ft. long; 40 ft. beam, and 23 ft. deep, with cellular bottom fore and aft, and partial awning deck. She has accommodation aft for captain and a few passengers, and accommodation under bridge for officers, engineers, refrigeration engineers and assistants, and forward for crew. She is fitted out for carriage of frozen meat, and powerful refrigerating plant, and insulated chambers are being provided capable of delivering about 200,000 cubic feet of cold air per hour. She will have combined steam and hand steering gear, six powerful winches driven from a horizontal multitubular boiler, and other appliances for convenience in handling, and for carriage of special cargoes. The ship will be lighted throughout by electricity, with portable lights for working in the hold, and cargo lights for working by night. Her machinery is of the triple-expansion type, having cylinders 24 in., 37 in., and 62 in. diameter, by 42 in. stroke, and arranged on Tweedy's patent system, and is supplied with steam from three powerful boilers, having about 6,000 feet of heating surface. She will have distiller, and fresh water evaporator for boiler-feed, with other modern appliances for economy and convenience. The vessel is for Messrs. Houlder Bros. & Co., of London, and is from the specifications and under the inspection of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool.

**Egremont Castle.**—Messrs. Palmer's Shipbuilding Co., of Jarrow, have launched from their yard a large steel screw steamer for Messrs. James Chambers & Co., of Liverpool, of the following dimensions:—310 ft. by 41 ft. by 23 ft. 10 in. She is of the well-deck type, built to the highest class at Lloyd's, and will be fitted with triple-expansion engines. She was christened the *Egremont Castle*.

**Eden Bridge.**—On December 9th there was launched from Messrs. Palmer & Co.'s yard, on the Tyne, a large screw steamer, built to the order of Messrs. J. Temperley & Co., of London and Newcastle, of the following dimensions:—Length, 325 ft., breadth, 40 ft., and depth of hold, 24 ft. She is calculated to carry 4,200 tons deadweight on a mean draught of 22 ft. 6 in. She is fitted with triple-expansion engines of the latest type, by the same firm, under the supervision of Mr. W. Whyte. She is also fitted with steam winches and other appliances for discharging and receiving cargo. She will also carry passengers. The christening ceremony was performed by Mrs. George Gunn, the wife of the representative of the firm at Newcastle. The vessel, which was named the *Eden Bridge*, has been built under the personal supervision of Captain Thomas Reynold, who has been appointed to command her. This is the second steamer built to the order of Messrs. Temperley & Co., for their new line, the first vessel, the *Tenbridge*, now being fitted out at Hartlepool.

**Charles Steel.**—On December 9th Messrs. John Priestman & Co. launched from their shipbuilding yard, Southwick, a steel screw steamer. Length, 238 ft., extreme breadth, 32 ft., 6 in., depth moulded, 16 ft. 7 in. She is built to the order of Messrs. Lilly, Wilson & Co., West Hartlepool, and is to be classed 100 A at Lloyd's. The engines have been built by Messrs. Hutson & Corbett, Kelvinhaugh Works, Glasgow, and are of about 600 I.H.P. The main boiler will have a working pressure of 160 lbs. The vessel was named the *Charles Steel*.

**Morayshire.**—On December 9th Messrs. R. and W. Hawthorn, Leslie & Co., Limited, launched from their shipyard, at Hebburn, a large passenger and cargo steel screw steamer for the colonial trade. Her dimensions are 350 ft. by 48 by 27, and she is specially fitted out for the dead meat trade. The machinery is also constructed by R. and W. Hawthorn, Leslie & Co., at St. Peter's Works, Newcastle. The vessel was named the *Morayshire*.

**Ariosto.**—On December 10th the steamer *Ariosto* was launched from Earle's yard, at Hull. It has been built for Messrs. Thomas Wilson, Sons & Co., for their Scandinavian passenger and mail service. The dimensions are:—Length, 300 ft., breadth, 38 ft., depth, 27 ft. 9 in. The ship is built of steel, with flush deck. Accommodation is provided for 53 first-class and 24 second-class passengers.

**Viceroy.**—On December 19th, at the shipyard of Messrs. Wood, Skinner & Co., Bill Quay-on-Tyne, a steel screw steamer was launched, built for the Marquis of Londonderry's Seaham

coal trade. The vessel is 185 ft. long, 30 ft. in breadth, and 14 ft. 3 in. in depth, and is constructed to carry about 900 tons deadweight. She will be fitted with all the latest improvements, and with masts and funnel to lower, to enable her to pass under the London bridges. Her engines will be triple-expansion, constructed by the North-Eastern Engineering Co. The Marchioness of Londonderry, who was accompanied by Mr. Adolphus Vane-Tempest, named the vessel *Viceroy*.

**Scottish Moors.**—On Saturday, December 21st, Messrs. Richardson, Duck & Co. launched from their building yard at South Stockton, a three-masted iron sailing ship of the following dimensions, viz.:—Length, 315 ft.; breadth, 42 ft.; depth of hold, 24 ft. 7 in.; gross tonnage, about 2,400 tons. This vessel, built to the order of Messrs. W. H. Ross & Co., is classed 100 A 1 in Lloyd's register under special survey. She has a poop, with accommodation for passengers, captain, and officers, and a deck-house amidships for crew, petty officers, and galley. She has been built under the superintendence of Captain Hamilton, and will be commanded by Captain Steel. As the vessel was leaving the ways she was gracefully christened the *Scottish Moors* by Miss Laverton, of London.

**John Bright.**—On Saturday, December 21st, Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions:—Length, 310 ft.; breadth, 41 ft. 6 in.; depth, 23 ft. 0½ in.; built to the order of Christopher Furness, Esq., of West Hartlepool. The vessel will class 100 A 1 at Lloyd's, and is of the well-decked type, with poop, containing saloon and state rooms, and cabins for officers; long raised quarter-deck; long bridge of extra strength right up to fore-hatch, and containing crew's quarters at fore-end, and engineers' berths aft; open topgallant fore-castle, with Emerson, Walker & Co.'s patent windlass. The hull is built on the web-frame principle, dispensing with hold beams, and giving a clear hold for stowing bulky cargo. Large hatchways are fitted, four steam winches, steam steering gear amidships, screw gear aft, two donkey boilers, and double bottom under each hold for water ballast. She will be schooner-rigged with pole-masts of iron. The boats will be carried on beams overhead, and a full equipment of all requisites will be provided to make the ship a first-class general trader. The engines are on the three-cylinder triple-expansion principle, and with two fine steel boilers, are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. The vessel was named *John Bright*.

#### LAUNCHES.—SCOTCH.

**Rydall Hall.**—On November 22nd Messrs. Caird & Co., ship-builders, Greenock, launched the steel screw steamer *Rydall Hall*, built to the order of Messrs. Alexander & Co., of Liverpool, the owners of the well-known Hall Line of steamers. The dimensions of the vessel are:—Length, 350 ft.; breadth, 42 ft.; and depth, 29 ft. 9 in., and of 3,250 tons register. She has been built under special survey for the three-deck rule, is classed 100 A 1 at Lloyd's, and is intended for the general cargo trade. Her engines supplied by the builders, are of the triple-expansion type, and will indicate 2,000 H.P.

**Chemnitz.**—On November 26th there was launched from the Shipbuilding and Engineering Works of Messrs. Alex. Stephen & Sons, Linthouse, a finely-modelled steel screw schooner-rigged steamer of about 2,700 tons gross, built to the order of the German Australian Steamship Co., of Hamburg, for their new service between Hamburg and Australia direct. The vessel has been constructed to the highest class in Lloyd's and Bureau Veritas, and also conforms with the Board of Trade and German Emigration Laws for carrying emigrants. She has two complete steel decks, the upper being sheathed with pine, has long full poop extending to midships and topgallant fore-castle forward. In fore part of poop superior accommodation has been fitted up for a limited number of first-class passengers including saloon and rooms for captain, officers, engineers, doctor, and petty officers, while in the after part of this erection there is suitable provision for 260 emigrants, the berths being wholly of iron, portable, and all parts interchangeable. The fore-castle is fitted up in a neat and substantial manner for the crew. She has a double bottom on the cellular principle for water ballast, and is fitted with steam and hand steering gear, steam winches, steam windlass, and all modern appliances for the efficient handling of ship and cargo, and will be lighted throughout with a complete installation of electric light, including Suez Canal lights. Her engines, fitted on board before

launching, are of the most improved triple-expansion type, having cylinders 23 in., 37 in., and 59 in. diameter, by 42 in. stroke, with ample boilers of steel for a working pressure of 160 lbs. As the vessel left the ways she was gracefully named the *Chemnitz* by Mrs. Uhde, wife of one of the company's superintending engineers.

**Latona.**—On November 27th Messrs. Russell & Co., Greenock, launched from their shipbuilding yard a splendid steel screw steamer of the following dimensions:—Length, 330 ft.; breadth, 42 ft.; and depth, 23 ft. 6 in.; of 3,100 tons gross, and showing a deadweight carrying capacity of 4,600 tons. On leaving the ways the new vessel was named *Latona*. She has been built to the order of Mr. G. M. Steeves, of Liverpool, and is intended for the East India trade. The *Latona's* triple-expansion engines, of 1,300 I.H.P., will be supplied by Messrs. Dunsmuir & Jackson, engineers, Glasgow. Mr. Steeves has ordered another steamer of about the same tonnage as the *Latona* from Messrs. Russell & Co.

**Quienne.**—On November 27th S. McKnight & Co., shipbuilders, Ayr, launched from their yard a steel-screw steamer named the *Quienne* for the Moss Steamship Co., Limited, Liverpool, for their Bordeaux and Liverpool Trade, being a sister ship to the *Gascogne* recently launched by them for the same owners. Dimensions:—Between perpendiculars, 230ft.; breadth, moulded, 31 ft.; depth of hold, 16 ft. 6 in.; 1,200 tons gross register; built under special survey to class 100 A1 in Lloyd's and to the Board of Trade requirements for a passenger certificate. The machinery, which is triple-expansion of 150 N.H.P., will be fitted by David Rowan & Son, Glasgow. The construction of these steamers has been carried on under the superintendence of Messrs. William Esplen & Son, Liverpool, to their plans and specification.

**Flying Vulture.**—On December 3rd S. McKnight & Co. launched from their shipbuilding yard at Ayr a twin screw tug for the Clyde Shipping Co. named the *Flying Vulture*. Her dimensions are:—Her length, between perpendiculars, 135 ft.; breadth, 24 ft.; depth, 13 ft. 6 in. The machinery will be supplied by Rankin & Blackmore, Eagle Foundry, Greenock.

**Glen Esk.**—On December 7th Messrs. Russell & Co., launched from their shipbuilding yard, Port-Glasgow, a steel barque for the Dundee Shipowners' Company, Limited. The vessel is 1,256 tons register, and of the following dimensions:—Length, 230 ft.; breadth, 36 ft.; depth of hold, 21 ft. 9 in. She will carry about 2,250 tons deadweight.

**Aud.**—On December 7th a steel screw steamer named *Aud* was launched from the Alloa yard of the Grangemouth Dockyard Company, by whom she has been built for Norwegian owners. The vessel is 194 ft. long, 29 ft. broad, and 14 ft. deep, the tonnage being 1000. The engines, which are of the triple-expansion type, have been constructed by Messrs. Ally & MacLellan, Glasgow. The cylinders are 14 in., 23 in., and 38 in. in diameter, with a stroke of 28 in. The cooling surface in the condenser is 700 square feet. There is one single-ended boiler 12 ft. 9 in. in diameter, by 10 ft. long, having three furnaces 36 in. inside diameter, with a grate area of 52 square feet, and a heating surface of 1412 square feet. At a pressure of 160 lbs. to the square inch, the power will, it is expected, be 500 I.H.P.

**Dumfriesshire.**—On December 10th Messrs. Russell & Co. launched from Kingston Yard, Port-Glasgow, a splendidly modelled large four-masted steel sailing ship, the principal dimensions of which are:—Length, 313 ft.; breadth, 42 ft.; depth, 24 ft. 6 in.; of 2,600 tons net register. This vessel, which was named the *Dumfriesshire*, is to the order of Messrs. Thomas Law & Co., Glasgow, and is built to the highest class at Lloyd's and Veritas. She is in every way equipped to adapt her for cargo carrying, being provided with all the most modern and approved appliances, and will prove a valuable acquisition to Messrs. Thomas Law & Co.'s "Shire" line.

**Santanderino.**—On December 10th there was launched from the yard of Messrs. David & William Henderson & Co., Meadowside, Partick, the *Santanderino*, a handsomely modelled steel screw steamer, of 3,140 tons gross, built to the order of Senor M. M. de Arrotegni, of Bermeo, Spain, through his Liverpool agents, Messrs. J. Glynn & Sons, and intended for the West Indian trade. Her dimensions are 325 ft. by 40 ft. by 28 ft. 9 in. The vessel has been built to class 100 A 1, spar deck, at Lloyd's. Accommodation is provided under the bridge

deck amidships for a limited number of first-class passengers, and for captain, officers, and engineers. Seamen and firemen are berthed forward under the top-gallant forecastle. She has been fitted with all the latest and most approved appliances for the rapid loading and discharging of cargo. She will be fitted with triple-expansion engines of 2,600 H.P., with cylinders 28 in., 44 in., and 71½ in. diameter by 48 in. stroke. The hull and engines have been constructed under the personal superintendence of Mr. George Hepburn, consulting engineer, Liverpool.

**H.M.S. Psyche.**—On December 10th Messrs. James & George Thomson launched from their shipbuilding yard at Clydebank, H.M.S. *Psyche*, built to the order of the Admiralty. The ceremony was witnessed by a select company. The divine service usual at the launch of Government vessels was conducted by Rev. Mr. Morton, of H.M.S. *Ajax*, and the naming ceremony was performed by Miss Julia Smith. The *Psyche* is one of a fleet of seven vessels designed to form a special squadron for the protection of the Australian Colonies. Five are protective deck cruisers and two gunboats. Two of the former have been built on the Clyde. One (the *Phanix*) was launched at Clydebank six weeks ago, and as a full description has already been given of the vessels, it is only necessary now to mention the principal features of the design. In dimensions and the method of construction the protective cruisers resemble the *Magicienne* and the *Marathon*, but are minus the copper-covered teak planking with which the latter are sheathed. They are of steel, principal dimensions being:—Length, between perpendiculars, 265 ft.; extreme breadth, 41 ft.; and the displacement will be 2,580 tons, at a mean draught of 15½ ft. The armament is to consist of eight 4.7 in. quick-firing guns on central pivot stands—two placed on the forecastle, two on the poop, and two each on the starboard and port sides of the upper deck; eight 3-pounder quick-firing guns, and several machine guns. Four torpedo tubes are to be fitted—one aft and one forward, and one on each broadside. The 4.7 in. quick-firing guns throw a shot weighing 45 lbs. with a charge of 10½ lbs. with sufficient force to penetrate rather more than 10½ in. of wrought iron at close range. The engines are of the triple-expansion type, driving twin screws, and under forced draught will propel the vessel at fully 19 knots. She is coated with Hartmann's Rahtjen's composition, and accommodation is provided for a crew of 190 men.

**Thames.**—On December 10th Messrs. R. Napier & Sons launched from their yard at Govan, the *Thames*, the third of four steel screw steamers of about 5,600 tons each for the Royal Mail Steam Packet Co., London. Two of the vessels, the *Atrato* and the *Magdalena*, were launched in the beginning of the year, and the fourth, the *Clyde*, will be completed a month or so hence. These magnificent steamships have been specially designed to meet the requirements of the company's West Indian, Brazil, and River Plate services; and in order to attain a high rate of speed with the greatest economy the hulls have been constructed upon fine lines, and the machinery consists of powerful triple-expansion engines capable of indicating 7,000 H.P., and fitted with all the most modern improvements. The general dimensions are:—Length over all, 456 ft.; breadth, extreme, 50 ft.; depth to spar deck, 33 ft. 4 in.; built of steel, to class 100 A 1 at Lloyd's under special survey, and to meet the Admiralty requirements as armed cruisers. The accommodation for the passengers is of the most luxurious description, and all the details have been carefully considered with special reference to a first-class service in a hot climate. To admit of perfect ventilation the dining saloon of the *Thames*, as of the others, has been placed upon the upper deck before the machinery, where there is no vibration. The promenade deck, upwards of 200 ft. in length, is entirely reserved for the first-class passengers, while the second-class have the poop for their own use. The accommodation for the latter is of a very superior description, but little inferior to the first-class. State-rooms for about 100 first and 40 second class are situated on the main deck. Superior accommodation has also been provided for 400 third-class passengers in the after part of the 'tween decks. The comfort of the officers has had special consideration, their cabins being large and handsomely fitted, and the crew are berthed in a large and roomy forecastle. The pantry and galley arrangements are replete with every convenience, to provide for 1,000 people, and refrigerating machinery and chambers have been fitted for a sufficient supply of fresh provisions during the whole voyage. It is worthy of note that the entire passenger accommodation is heated by steam, and that the electric light is fitted in every part of the ship. The most modern improvements have

also been introduced for the rapid and noiseless handling of cargo and the efficient working of the ship, including Brown's hydraulic cargo gear, Chadburn's telegraphs, Sir William Thomson's compasses, steam windlass, and steering gear, and coated with Hartmann's Rahtjen's composition. Having been built with a handsome clipper bow and figurehead, the ship has a most symmetrical appearance, which will be enhanced by a smart rig, and altogether this magnificent vessel will be one of the most complete and artistically-fitted passenger steamers afloat. It reflects great credit upon the enterprise of the Royal Mail Co. in adding four such splendid steamships to their fleet. The ship and machinery have been constructed under the supervision of Mr. Bowers, the company's superintending engineer, with Mr. Shelton as resident inspector, and when completed the *Thames* will be placed under the command of Captain Hicks. The christening ceremony was performed by Miss Curtis, daughter of Mr. Spencer Curtis, of the Royal Mail Steam Packet Co. Immediately after the launch Messrs. Napier entertained a large company of ladies and gentlemen to lunch in the drawing-room of the firm's premises.

**Peridot.**—On December 11th there was launched from the shipbuilding yard of Messrs. John Fullerton & Co., Paisley, an iron screw steamer of 230 tons gross, named the *Peridot*, built to the order of Mr. Wm. Robertson, 88, Great Clyde Street, Glasgow, for his general carrying trade. Compound engines of 45 H.P., will be supplied by Messrs. Ross & Duncan, Govan.

**Monowai.**—On December 11th Messrs. Wm. Denny & Brothers, Dumbarton, launched the steel screw steamship *Monowai*, of Dunedin, for the Union Steamship Co. of New Zealand. The *Monowai* is of about 3,500 tons gross register. She will be fitted in the company's usual luxurious style for a large number of first and second-class passengers, and supplied with powerful triple-expansion engines by Denny & Co.

**Nidaros.**—On December 11th Messrs. Lobnitz & Co. launched from their shipyard, Renfrew, the screw steamer *Nidaros*, for the United Steamship Co. of Copenhagen, for their passenger service between Denmark and Norway. The dimensions of the vessel are:—190 ft. length on waterline; 29 ft. beam, moulded; and 16 ft. 6 in. depth moulded to main deck. She has a long poop for the accommodation of first-class passengers and for officers, and the second-class passengers and crew are accommodated in a long fore-castle. She will be fitted with triple-expansion engines of 900 H.P., constructed also by Lobnitz & Co.

**Alexandra.**—On December 13th Messrs. William Simons & Co. launched complete one of their patent dredging steamers named *Alexandra*. It has a lifting capacity of 400 tons an hour, carries 400 tons debris, and is capable of dredging shoals to 35 ft. depth of water. Fitted with triple-cylinder engines and boilers of 800 H.P., its first work is to deepen the outer bar at the Port of Alexandria, and will leave in a few days for Egypt.

**Lady Torfrida.**—On December 14th there was launched from the yard of the Fairfield Shipbuilding Co., Limited, Govan, a steel auxiliary-screw steam yacht, named the *Lady Torfrida*, which has been built for Sir William George Pearce, Bart. She has been built with scantlings equal to Lloyd's highest yacht class, has a clipper stem with handsome figurehead, and elliptical stern. She is 160 ft. long, 27 ft. beam, and 17 ft. depth, moulded, and her tonnage is 515. The vessel is barquentine rigged; fitted with steam windlass, steam and hand steering gear. A large steel deck-house amidships, covered with teak, encloses the engine and boiler space, deck saloon, and in addition affords entrances to the cabins fore and aft. The accommodation is spacious and replete in every respect. The yacht will be fitted with triple-expansion engines, having cylinders of 14½ in., 24 in., and 39 in. diameter, with a stroke of 2 ft. The shafting throughout is supplied by Messrs. Vickers, Sons & Co. The propeller is two-bladed, and of manganese bronze, the blades being made to feather on Bevis's principle until they stand fore and aft when the vessel is under canvas. Steam will be supplied at a pressure of 160 lbs. by one single-ended boiler, having two Fox's corrugated furnaces. There will also be a small donkey boiler made by Cochran & Co. for supplying steam to the electric light engines and for other auxiliary purposes.

**Anubis.**—On December 19th Messrs. Aitken and Mansel launched from their yard, at Whiteinch, a steel screw vessel of about 2,500 tons register, for Messrs. James Moss and Co.,

Liverpool. Dimensions:—320 ft. long by 39 ft. by 22 ft., with accommodation for about 80 passengers. The machinery, of the triple-expansion type, will be fitted by Messrs. David Rowan and Son, Glasgow. The vessel was named the *Anubis*, and is to be employed in the company's Egyptian line of steamers between Liverpool and Alexandria.

#### LAUNCH—IRISH.

**City of Vienna.**—On December 7th there was launched a large steel screw steamer, by Messrs. Workman, Clark & Co. Limited, of Belfast, for Messrs. George Smith & Sons, of Glasgow. This vessel is the latest addition to the City Line of passengers trading between Glasgow, Liverpool, London, and Calcutta. As she left the ways she was named the *City of Vienna* by Miss Maud M'Causland. The dimensions of the vessel are:—Length between the perpendiculars, 412 ft.; breadth, moulded, 26 ft. 4 in.; depth of hold, 29 ft. 3½ in.; gross tonnage, about 4,450. She is to class 100 A 1 in Lloyd's Registry; but has been built considerably stronger than Lloyd's require. The engines, which are being supplied by Messrs. John and James Thomson, of Glasgow, are of the triple-expansion type.

#### TRIAL TRIPS.

**Pao Ching.**—On September 18th the s.s. *Pao Ching*—or the "Precious and Pure"—a twin-screw steamer, designed and constructed by Messrs. S. C. Farnham & Co., Shanghai, and built to the order of Messrs. Buchheister & Co., and forming the latest addition to the list of vessels engaged on the Yangtze, went her trial trip. She is a steamer of 1,072½ tons register, 220 ft. long, 30 ft. beam, 38 ft. over all, 12 ft. depth of hold, with a mean draught of 5 ft. 6 in. Her engines, of which she has two pairs, are of the inverted direct-acting, surface-condensing, compound type, of 90 H.P.N., and the cylinders are 16 in. and 32 in. diameter, with a stroke of 18 in. She has one mild steel boiler with three ribbed furnaces. She is built of mild steel up to the main deck, the rest, with the decks, being Oregon pine, with teak guards and covering boards. The trial trip, we are informed, was most satisfactory. She ran the measured mile, with 120 tons deadweight on board, in five minutes, the engines making 116 revolutions, and the boiler carrying 90 lbs. of steam. The vessel and engines have been built entirely by Messrs. S. C. Farnham & Co., Shanghai.

**Kong Raguar.**—On November 17th the new steamer *Kong Raguar*, built at Aker's Engineering Co., Norway, had a satisfactory trial trip. Her dimensions are:—Length, 197 ft.; breadth, 27 ft.; and depth, 14 ft. 7 in. Her capacity is 840 tons. She has very good passenger accommodation, water ballast in midships, tank and double bottom in aft compartment, steam steering gear, three steam winches, &c. The engine is triple-expansion with surface-condenser; it indicates 563 H.P., and works with 160 lbs. steam pressure. At the trial trip she made 12 knots with a consumption of 1·42 lbs. of coal per hour per I.H.P.

**Asta.**—On November 20th the new steamer *Asta*, built at the Elsinore Iron Shipbuilding and Engineering Co. for account of the Ostersen Steamer Co., at Copenhagen, had a very satisfactory trial trip. She is built entirely of steel to Bureau Veritas' highest class special survey. She is 148 ft. long, 24 ft. broad, and 11 ft. deep in the hold. The engine is a compound of 250 I.H.P. A speed of 10·4 knots was reached with a consumption of 1½ lb. of coal per H.P. per hour.

**Samara.**—On November 22nd the *Samara* (s), built to the order of Messrs. MacLay & McIntyre, Glasgow, by Messrs. Mackie & Thomson, Govan, and engaged by Mr. Wm. Kemp, Govan, proceeded on her trial trip, when an average speed of 10½ knots was attained, which was considered very satisfactory. The *Samara* is a steel steamer, 260 ft. by 36 ft. 9 in. by 19 ft. 2 in. moulded, designed to carry about 2,600 tons deadweight, and has triple-expansion engines 18 in., 29 in., and 46 in., by 39 in. stroke, the working pressure being 160 lbs.

**Russia.**—On November 22nd the Hamburg American Steam Packet Co.'s new steamer *Russia*, built by Messrs. Laird Brothers, made her official trial trip at the mouth of the Mersey, and her performance being in every way satisfactory and amply fulfilling the requirements of the contract, she was taken over by the

representatives of the company and proceeded direct to Hamburg, where she arrived at noon on Monday last, having, we are informed, made the voyage at an average speed of 14 knots per hour. The *Russia* is of 4,017 tons gross register and 3,500 I.H.P. and is intended for the company's emigrant and cargo service between Hamburg and New York, and though she has handsomely fitted accommodation for a few first-class passengers, her special feature is her very complete installation for steerage passengers, of whom she will carry about 1,300. They are placed on the main and lower decks, all the berths being of wrought-iron and subdivided into small compartments, so as to make them as private as possible. Great attention has been paid to the ventilation and lighting of these spaces, and also to the access to the upper deck; which, looking to the great subdivision of the vessel into watertight compartments, being such as to render her perfectly safe in the event of any one of the large compartments becoming filled with water, has been a matter of some difficulty, involving special deckhouse companions, &c. The latrines, wash-houses, and other sanitary arrangements are contained under the shelter of the poop and fore-castle, to which there is access from below, without the necessity of going along the exposed deck in bad weather. The emigrant fittings are all portable, and can be removed at that time of the year when it is desired to carry cargo only, and no emigrants; but even when full of the latter, she will have a large space available for cargo. The vessel has been built under special survey for the Bureau Veritas' highest class, including their special mark (Y) as being practically unsinkable.

**Deerhound.**—On November 23rd the steam trawler *Deerhound*, the 11th vessel built for the Humber Steam Trawling Co., went on her trial trip. The distance between the Newsand, Bull, and Middle Lightships was done at the speed of 10½ knots an hour—a performance which gave the greatest satisfaction to her owners and all aboard. The measurements of the *Deerhound*, which has been built by Messrs. Cook, Welton, and Gemmell, are:—Length 100 ft.; breadth, 20 ft. 9 in.; depth of hold, 11 ft. She is propelled by compound condensing engines (cylinders, 17 in. by 33 in. with a 22 in. stroke), and her boilers will bear 90 lbs. pressure.

**Raisby.**—On November 25th the steamer *Raisby*, a new vessel 272 ft. 3 in. by 38 ft. 10 in. by 20 ft. 9 in., built by Messrs. Ropner & Co., of West Hartlepool, left the Tees, for her trial trip. Her triple-expansion engines, of 160 H.P.N., having cylinders 21 in., 35 in., 57 in. by 39 in. stroke, and working at 160 lbs. pressure of steam, are by Messrs. Blair & Co. Limited, of Stockton. She attained a speed of about 10 knots.

**Fonar.**—On November 26th the s.s. *Fonar*, built by Wigham, Richardson & Co., of the Neptune Works, Newcastle-on-Tyne, for the Manchester District Shipping Co., to the order of Messrs. George Tweedy & Co., of London and Odessa, was taken to sea for her trial trip. She is the eighth vessel constructed by this firm for Messrs. George Tweedy & Co. She is built of steel, on the spar-deck rule with poop, bridge and fore-castle, and will carry nearly 6,000 tons of measurement cargo, besides bunkers, &c. The vessel is fitted with quadruple-expansion engines, designed and patented by Wigham, Richardson & Co., and are of a novel type, which marks a new departure in marine engineering. The engines are 21 in., 29 in., 42 in. and 60 in. diameter respectively by 42 in. stroke, and each cylinder works a separate crank, and while, on first thoughts, this might appear to involve complications and multiplications of parts with crowding of gear and inaccessibility, the builders are to be congratulated that the result showed great simplicity and a remarkably smooth-running engine, the weights of the moving parts of one engine being balanced by another, and for starting and stopping the engines, this type is even better adapted than the three-crank triple-expansion engine. The crank shaft is supported in six bearings, and advantage has been taken of the fact that the cranks are opposite each other in pairs, to simplify the valve gear of the engines. The gear is of the Stephenson link motion type, which the builders find to be the most satisfactory of any, and three sets of gear only are made to do duty for the four engines. The working of the engines was greatly admired by all on board, amongst whom were several eminent men of the engineering world. The vessel attained a speed of nearly 13½ knots, with a boiler pressure of 173 lbs. per square inch. The power was remarkably uniform in all, the cylinders being 403 in the H.P., 413 in the first intermediate, 437 in the second intermediate, and 445 in the low-pressure cylinders, or 1,688

in all, while the range of temperature was exceedingly low, being 58°, 58°, 62°, 51°. Profiting by the experience gained in this vessel, Messrs. Wigham, Richardson & Co. hope to still further improve this system of quadruple-expansion engines.

**Geland.**—On November 27th the steam trawler *Geland* went on her trial trip. The vessel has been built for the Liverpool Steam Fishing Co., Limited, by Messrs. Cochrane, Cooper & Schofield, of Beverley, to the order of Messrs. Charles D. Holmes & Co. She made 10½ knots, which was considered very satisfactory. The *Geland* is 100 ft. long by 20 ft. 3 in. by 11 ft. depth of hold, and has been fitted by Messrs. C. D. Holmes & Co. with engines of the triple-expansion type of 45 N.H.P.; having cylinders 11½ in., 18 in., and 30 in. diameter, by 22 in. stroke, and suitable boiler.

**Guide.**—On November 29th and 30th this vessel was taken to sea for steam trials. She was built by Messrs. W. B. Thompson & Co., of Dundee, for Her Majesty's India service. She is 215 ft. long, 30 ft. beam, and 15 ft. 3 in. deep, propelled by twin-screw triple-expansion engines, 20 in., 30 in., and 54 in. cylinders, by 36 in. stroke, supplied with steam at 160 lbs. pressure from two large double-ended boilers, 12 ft. 9 in. diameter, by 17 ft. long. She is specially designed for the India service, the saloon and state rooms being 9 ft. high, and fitted out and ventilated for the tropics, and electric light is fitted through the ship and machinery departments. During four hours' full-speed run at sea the machinery worked without the slightest hitch or heating, and was handled with the greatest ease, the speed attained being fully 14½ knots. Six full-speed runs were made upon the measured mile under the contract, and the diagrams taken showed an indicated H.P. of 2,520. The ship has been constructed under the supervision of Sir E. J. Reed, M.P., who was represented on board during the trial trip by Mr. Hudson and Mr. Barnaby, and Messrs. Flannery, Baggallay & Johnson, engineers, of London.

**Mount Hebron.**—On November 30th the steamer *Mount Hebron*, recently built by MacIlwaine & MacColl, went on trial in Belfast Lough, and sailed the same afternoon for Newport, Mon., to load. The *Mount Hebron* belongs to Messrs. Smith & Service, Glasgow, and is of the well-deck type, 300 ft. long by 41 ft. 4 in. beam, and 22 ft. 9 in. deep, with triple engines, 23 in., 37 in., and 60 in., by 42 in., and steel boilers, with six spiral corrugated Farnley furnaces, working at 160 lbs. pressure. The owners were represented by Mr. Service and Mr. Pairman, who, we are informed, express their entire satisfaction with the ship and with the results attained.

**Moness.**—On December 2nd the new screw steamer *Moness*, which has been built and fitted out by Messrs. J. Readhead & Sons, South Shields, for Messrs. Maclean, Doughty & Co., of West Hartlepool, left the Tyne on her trial trip. The vessel is 290 ft. long by 39 ft. wide, and 21 ft. 8 in. deep, moulded, and has a deadweight capacity of 3,500 tons. She is of the well-decked type. The engines, also built by Messrs. Readhead & Sons, are triple-expansion, the cylinders being 22 in., 36 in., and 60 in. in diameter, with a 39 in. stroke. Steam is supplied from two steel boilers, at a working pressure of 160 lbs. per square inch. The trial was in every respect satisfactory.

**A New Steamer for Turkey.**—A paddle-wheel steamer, of 450 tons burthen, has just been built for the Imperial Ottoman Government by Messrs. Samuda Brothers, Poplar. This vessel is designed for carrying passengers from Constantinople to Princes' Island, on the Sea of Marmora, which place forms the great summer resort of the aristocracy of Turkey. The principal dimensions of the ship are:—Length, 180 ft.; breadth, 22 ft.; depth, moulded, 9 ft.; draught of water, 5 ft.; and she is classed A at Lloyd's. Her engines are of the jet-condensing, oscillating type, indicating 550 H.P., and were built by Messrs. John Penn & Son, of Greenwich. The official trial of this steamer took place on Monday, December 2nd, when she ran from Blackwall Pier to Sea Reach and back, besides doing the measured mile runs. The specified contract speed was 14 knots, and this speed was attained both on the measured mile and throughout a continued trial of nearly two hours. Captain Halil Bey, the Naval Attache at the Ottoman Embassy, who has had the ship under his charge, attended the trial, and congratulated both Messrs. Samuda and Messrs. Penn, on behalf of the Sultan and the Ambassador, on the successful results achieved by the vessel. She is to be named by the Sultan when she arrives at Constantinople.

**Athlete.**—On December 2nd the new twin s.s. *Athlete*, built by the Canada Works Engineering & Shipbuilding Co., Birken-

head, for T. W. Thompson, of Eastham Ferry, proceeded down the Mersey on her official trial trip, the result of which showed that a mean speed of 15 knots per hour had been attained, the machinery developing 900 I.H.P., and working throughout without a hitch. After the official trial had been completed, the vessel left the river and proceeded to Kingstown, *via* Holyhead and back to Liverpool, during the whole of which extended run the machinery worked with the greatest smoothness, and proved that the steam generating powers of the boiler were ample, and that the high rate of speed formerly attained could be maintained on a lengthened run, and that on a very moderate consumption. The vessel has been constructed under the supervision of the Board of Trade and Lloyd's surveyors and J. G. Kinghorn, consulting engineer, Liverpool. She has not yet been fitted with passenger accommodation, as the owner intends disposing of her, consequently the purchasers have the option of either fitting her out as a fast passenger despatch vessel or a powerful ocean-going tug, either of which purposes she is eminently suited for. The following are a few of the principal dimensions:—Length, 150 ft.; breadth, 22 ft. 8 in.; depth, 12 ft. 3 in.; two pairs of compound surface-condensing engines, each having cylinders 18 in. and 36 in., with a stroke of 24 in.; one double-ended cylindrical return tubular boiler, 16 ft. long by 12 ft. diameter, having four furnaces 3 ft. 6 in. diameter and 6 ft. 3 in. long, constructed throughout of steel for a working pressure of 100 lbs. per square inch,

**Oranje Prince.**—On December 3rd the tank screw steamer *Oranje Prince*, built at the Walker Yard of Sir W. G. Armstrong, Mitchell & Co., was taken to sea for trial. The vessel is built of steel to the highest class at Veritas, on Swan's patent principle, for the carriage of petroleum in bulk. The machinery has been constructed by the Wallsend Slipway and Engineering Co., on the triple-expansion system, embracing all the latest improvements, and during the trial worked without a hitch. The weather being foggy, no runs over the measured mile could be made.

**Sicily.**—On December 4th the steamer *Sicily*, belonging to Messrs. David MacIver & Co., Liverpool, was taken out for a trial of her machinery, which has just been converted into quadruple-compound by Messrs. Laird Brothers, of Birkenhead. The result was most satisfactory, the machinery working without a hitch, and the power developed exceeding what was expected, but owing to the fog it was not possible to make the usual mile run.

**Rajah Brooke.**—On December 4th the official trial took place of the steel screw steamer *Rajah Brooke*, recently launched by Messrs. Napier, Shanks & Bell. This vessel, built for the Borneo Co., Limited, London, from designs prepared by Mr. Joseph H. Ritchie, naval architect, London, is 225 ft. long, 31 ft. 6 in. beam, and 22 ft. 9 in. deep, 1,218 tons gross, and 769 tons net register. The engines, 1,000 H.P., are of the triple-expansion type, supplied by Messrs. Bow, M'Lachlan & Co., Paisley, and on a trial lasting over six hours worked with the utmost smoothness. The mean speed of vessel over the measured mile was 10½ knots, being in excess of contract requirements.

**Kriemhild.**—On December 4th the new steel screw steamer *Kriemhild*, built by Messrs. C. S. Swan & Hunter, Wallsend, for the Deutsche Dampschiffs Rhederei, of Hamburg, for their line from Hamburg to China and Japan, was taken off to sea at the mouth of the Tyne, for a three-hours full speed trial. The vessel is 335 ft. long, over all; 39 ft. broad; and 25 ft. 9 in. depth, moulded; and is built on the three-deck rule to Lloyd's highest class, with spare gear and the German Government requirements for passenger steamers. All weather decks are of teak, two steel decks being also provided for strength, with cellular double-bottom throughout. A long full poop is fitted with very handsome accommodation for first-class passengers, including an elegantly fitted up smoke-room in white marble, by the Elswick Court Marble Works Co., of Newcastle, and large ladies' boudoir in house on poop-deck. A long bridge-house amidships covers all officers' berths, &c. A very large galley is fitted, which may be utilized for first-class passengers and emigrants, and the officers' mess-room is large enough to accommodate a large number of passengers when the vessel is carrying troops. A long topgallant forecabin is also fitted with ample accommodation for native crews, with steam heaters, lavatories, and patent direct steam windlass above. Electric light is fitted all over the vessel, including large cargo-lights, electric bells, &c. The 'tween decks forward is intended for carrying emigrants or troops, and contains extra large store-

rooms, ice-cellar, &c. The engines and boilers have been built by the Wallsend Slipway and Engineering Co., Limited, of Wallsend, and are 27 in., 44 in., and 71 in. diameter, by 48 in. stroke, and are driven from two large double-ended steel boilers, with a working pressure of 160 lbs. per square inch. The trial of the machinery passed off very satisfactorily, without the slightest hitch or stoppage, and an average mean speed of 13½ knots was easily attained.

**Mira.**—On December 6th the new steamer *Mira*, for the Star Line of Calcutta, constructed by Messrs. Aiken & Mansel, Whiteinch, and engined by Messrs. John and James Thomson, Glasgow, to the order of Messrs. Thomas and James Harrison, Liverpool, went on her trial run. The vessel is 350 ft. long, 40 ft. broad, and 27 ft. 8 in. deep, and the gross tonnage 3,200 tons. The engines are of the triple-expansion type, with cylinders 24 in., 40 in. and 66 in. in diameter, with a stroke of 4 ft. The condensing surface is 3,036 square ft. The boilers, two in number, are single-ended, 13 ft. in diameter by 16 ft. long, and there are eight furnaces 3 ft. 6 in. in diameter. The grate surface is 144 square feet, and the heating surface is 4,922 square feet. The propeller is 17 ft. in diameter, with a 19 ft. pitch, and 82½ square feet surface. The working pressure is 160 lbs. to the square inch. At 59 revolutions the engines indicated 1,350 horse-power, and at full speed 1,850 indicated horse-power.

**Tordenskjold.**—On December 7th the new screw steamer *Tordenskjold* left North Shields for a trial trip. The vessel, which has been built by Messrs. T. W. Smith, North Shields, for Mr. Wilhelmssen, Tonsberg, is a cargo steamer of the following dimensions:—Length, 225 ft., breadth, 32½ ft., draught, 15 ft. 8 in. The engines have cylinders 16½ in., 27 in., 44 in., and 33 in., and have been built by the North-Eastern Marine Engineering Company, Limited, Wallsend. During the trial the engines worked without a hitch of any kind, giving every satisfaction.

**Krim.**—On December 10th the screw steamer *Krim* recently launched by the Blyth Shipbuilding Co., Limited, from their works at Blyth, for Norwegian owners, was taken to sea for the customary trial trip. There was on board a party of gentlemen representing the shipbuilders, owners and engineers. The usual trial of speed was made over the measured mile with very highly satisfactory results, a mean speed of 10½ knots being obtained. After spending an enjoyable afternoon at sea, the *Krim* returned to Blyth to bunker, after taking her bunker coals she will proceed to the Tyne to load for the Mediterranean. The *Krim* measures 260 ft. long by 36½ ft. broad and 19½ ft. deep, and is built of iron and steel to Lloyd's highest class, and is fitted throughout in the most complete manner. The engines are by Messrs. Black, Hawthorn & Co., of Gateshead, with cylinders 20 in., 33 in., and 54 in. by 36 in. stroke, and 160 lbs. working pressure. The machinery has been constructed under the superintendence of Messrs. W. Menzies & Co., of Newcastle-on-Tyne, on behalf of the owners. Captain Hagemann, who has looked after the completion of the vessel, will take command.

**Orion.**—On December 11th the s.s. *Orion*, a fine steel screw steamer which has been built by Messrs. Raylton, Dixon & Co. for Messrs. Thos. and Jas. Harrisons' Star Line between Liverpool and Calcutta, proceeded from the Tees on her trial trip. The vessel is of the following dimensions:—Length over all, 361 ft. 6 in.; breadth, 40 ft.; depth, 29 ft. 2 in., with a dead-weight capacity of 4,450 tons. She is built on the spar-deck type, with short poop aft and Liverpool House for accommodation of sixteen passengers, the saloon being beautifully decorated in ornamental panelling, stained glass, &c. Her deck arrangements and fittings are unusually complete, and her boats are fitted on "Gell's" patent stands, which give the greatest ease in launching and lowering. Her engines, which have been supplied by Messrs. Blair & Co., Stockton, having cylinders 24 in., 40 in., and 66 in. by 45 in. stroke, gave every satisfaction on trial. She has been built under the inspection of Mr. R. D. Barlett, superintendent for her owners, and Mr. C. W. Cadman, their chief engineer. This is the eighth vessel built by Messrs. Raylton, Dixon & Co. for this firm.

**Musashi Maru.**—On December 12th the steamship *Musashi Maru*, of 2,640 tons, and 2,000 H.P., built by Lobnitz & Co., of Renfrew, for the Nippon Yusen Kaisha of Japan was taken on her trial trip between the Cloch and Cumbrae Lights. Although the weather was unfavourable for accurate steering

n consequence of the thick fog prevailing during almost the whole continuance of the trials, the speed attained was fully  $12\frac{1}{2}$  knots per hour average on the double run between the lights. This speed was very satisfactory to all concerned, being a knot and a half per hour more than that guaranteed by the builders. The consumption of coal was also very satisfactory, being 14 per cent. less than that guaranteed. The trial was made under the control of Captain A. R. Brown, Japanese Consul, and of Captain Periam and Mr. McFarlane, the company's superintendents.

**Stuttgart.**—On December 13th this fine new screw steamer, built by the Fairfield Shipbuilding and Engineering Company for the Norddeutscher Lloyd of Bremen, went down the Clyde on her trial trip. Her principal dimensions are:—Length, 430 ft. 10 in.; breadth, moulded, 48 ft.; depth, moulded, 33 ft.; and of 5,200 tons. Her engines are of the triple-expansion type, with three cylinders—the high pressure 31 in., the medium pressure 52 in., and the low pressure 83 in.—and all are adapted to a stroke of 4 ft. 6 in. The high-pressure cylinder is fitted with a piston valve, and the medium and low pressures each by an ordinary double-ported slide valve. The reversing of the engines is effected by one of Messrs. Brown Brothers' (Edinburgh) engines. The engines are fitted with all the latest improvements for economy, including Messrs. G. and J. Weir's feed-heater and pumps, and an evaporator by the same makers. The shafting is made of steel throughout, the crank and propeller shafts being forged by Messrs. Vicker, Sons & Co., and the thrust and tunnel shafts by Messrs. John Brown & Co., Sheffield. The propeller boss and blades are of cast steel. The steam is supplied to the engines by two double-ended and two single-ended boilers, the two single-ended being principally used for auxiliary purposes. The double-ended boilers are 14 ft. 4 in. in diameter and 17 ft. long, and the single-ended 14 ft. 4 in. in diameter and 9 ft. 8 in. long. The former are fitted with Fox's patent corrugated furnaces, manufactured by Leeds Forge, and the latter with ribbed furnaces, manufactured by Messrs. John Brown & Co. They are all constructed for a working pressure of 150 lbs. per square inch. The whole machinery has been constructed to pass the Board of Trade and Germanischer Lloyd's survey. On trial a straight run was made from the Cloch Lighthouse to the Curragh, <sup>the</sup> ~~the~~ use against wind and tide, the run occupying 1 h. 5 min. 11 secs. The *Stuttgart* was held on until opposite Pladda, when she was put about. The weather was beautiful in the extreme. The return run between the light-houses was overtaken in 1 h. 2 mins., and the mean speed was over 13 knots, which is in excess of the guaranteed speed. The Tail of the Bank was reached about half-past four o'clock, and thereafter dinner was served. Amongst the gentlemen present were:—Mr. Meyer, representative director of the North German Lloyd; Captain Lees, of the Germanischer Lloyd; Captain H. Heinicke, in command of the *Stuttgart*; Mr. Koch, chief engineer; Mr. Kruss, superintending engineer of the Norddeutscher, &c. Mr. R. S. White represented the Fairfield Co., and Mr. A. Laing, also of the Fairfield Co.

**Kaviana.**—On December 19th the s.s. *Kaviana*, built of steel by the Ailsa Shipbuilding Co. at Troon, and engined by Messrs. Dunsmuir & Jackson, Govan, to the order of the British India Steam Navigation Co., went on her official speed trials on the Clyde, and attained results above what was guaranteed. The dimensions of the steamer are:—Length, 240 ft.; breadth, 34 ft.; and depth, moulded, 25 ft. to shade deck. The propelling machinery is of the triple-compound type, with cylinders 25 in., 40 in., and 65 in. in diam., with a stroke of 42 in. There are two double-ended boilers, each 12 ft. in diam. by 16 ft. 6 in. long, with a grate area of 156 square ft., and a heating surface of 4,630 square ft. The condensing surface is 2,400 square ft. With a steam pressure of 160 lbs. to the square in., and at 80 revolutions, the power developed was 2,165 I.H.P., the vacuum being 27 in. The vessel had 800 tons on board, and attained a speed of  $13\frac{1}{2}$  knots on the measured mile.

**Sirius.**—On December 19th the screw steamer *Sirius*, recently launched by the Blyth Shipbuilding Co., Limited, from their building yard at Blyth, for Bremen account, was taken to sea for the customary trial trip, and after a good trial of speed was made over the measured mile, with results which were highly gratifying to all concerned, the vessel returned to Blyth. The *Sirius* is built of iron, and measures  $181\frac{1}{2}$  ft.; breadth, 26 ft.; and depth,  $15\frac{1}{2}$  ft. She has been built to Lloyd's highest class, and is fitted throughout in the most complete manner. The engines are by Messrs. Matthew Paul & Co., of Dumbarton.

**Eiffel Tower.**—The screw steamer *Eiffel Tower*, built by Messrs. William Dobson & Co., of Low Walker, for the Tower Line of steamers, London, 347 ft. in length over all, 40 ft. 3 in. beam, and depth 29 ft. 5 in., was lately taken to sea for a light trial, when a speed of  $11\frac{1}{2}$  knots was obtained. Since then the vessel has been loaded with 4,400 tons deadweight, and went to sea on November 20th, for loaded trial, the speed obtained being  $10\frac{1}{2}$  knots, which was considered very satisfactory. The machinery was supplied by the Wallsend Slipway and Engineering Co., Limited, cylinders being 23 in., 38 in., and 61 in. by 32 in. stroke, and the engines during the trials worked perfectly. After the trial the vessel sailed for Malta.

## Correspondence.

[It must be understood that, in giving insertion to communication under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

### FAST PASSAGES.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—I have read with great interest the correspondence in your columns on the above subject, and the various arguments put forth to show that the captain, according to one side, and that the chief engineer, according to the other side, should have all the credit.

I venture to think that neither side will ever convince the other, for it seems that they are both right. Surely, sir, the position is this—engineers, firemen, navigating officers, quarter-masters, and every one else in the ship must do his duty to the best of his ability to enable the ship to perform her passage to her best advantage, and if the engineers fail in their manifold duties, or the firemen or quarter-masters in their more simple ones, the result would be the same; namely, that the passage would be spoiled; and therefore credit is due to them all for a good passage, if indeed any credit be due to a person for simply doing his duty.

In these days of competition amongst owners, if any one were unnecessary to the due working of the ship, his services would soon be dispensed with; and everyone who fulfils his duty properly, so it seems to me, contributes to the end all have in view—the making of a fast passage.

The whole controversy is an illustration of the very old fable called "*The Belly and the Members*." As you will remember, the story simply came to this: The various parts of the body got tired of working, whilst the belly in their midst did no apparent work, but he thrived and benefited by the work of them all. So the various members "*struck*" and refused to fulfil their functions because the belly got credit for it all. The eye refused to see, the ear to hear, the mouth to feed, the hand to carry food to support it in its laziness, but they found that, though they injured it by doing so, they injured themselves through it too.

Possibly the captain's work, nowadays, when all goes well, may not be as obvious as that of the chief engineer; but, rely on it, a captain still has a good deal to say as to the working of his ship, and he cannot yet be dispensed with.

Yours obediently, B. W. G.

Temple, E.C., December 12th, 1889.

### FAST STEAMING.

To the Editor of THE MARINE ENGINEER.

SIR,—In your monthly journal of December I saw, when reading your Miscellaneous on fast steaming from the Cape to Southampton by the Union Company's Royal Mail Steamer *Moor*, with a net steaming time of 17 days, 9 hours, 12 minutes, giving this, when the distance run is 6,008 miles, an average speed of  $14\frac{1}{4}$  knots per hour over the whole course.

Thereupon you mention of a fast steaming from the Cape to Southampton, performed by the Union Company's Royal Mail Steamer *Mexican*, with a net steaming time of 17 days, 8 hours, 21 minutes. Both steamers went *via* Madeira.

The distance run by the steamer *Moor* was 6,008 miles, and the distance run by the steamer *Mexican* only 4,987 miles.

There can be a slight difference in the distance of run of two steamers, when they have to make the same trajet, but 1,020 miles, or about 16 per cent. (in this case) is too much I believe.

The average speed of the steamer *Mexican* over the whole course was 14.3 knots per hour, which gives for a net steaming of 17 days, 8 hours, 21 minutes, a distance of run not 4,987 but about 5,987 miles, just 1,000 miles more than your account.

I believe, therefore, there will be a little fault in this number 4,987.

As for "Justice" (Correspondence, October, '89) I believe he thinks it to be clever *Captains* (?) who can so blow the wind so incessantly strong through the stern tube, to make such fast passages over the ocean.

I remain, obediently,

ONE OF YOUR DUTCH READERS.

Helder, 10th December, 1889.

#### FORCED DRAUGHT.

To the Editor of THE MARINE ENGINEER.

SIR,—In your current issue I notice a letter which professes to supplement a paper on "Forced Draught" recently read by me and noticed in your columns. I do not feel called upon for a reply to those who have read my paper in full as published elsewhere, as I believe it covers most of the points raised by your correspondent.

With regard to his claim of priority in the successful application of forced draught, he will perhaps be surprised to learn that Mr. James Howden, having given the closed ashpit with air-tight fire-door (which Mr. Cates claims as his invention) an exhaustive trial, found it to be an uneconomical method at low, and a thoroughly impracticable one for high rates of combustion, and consequently abandoned it about 27 years ago; therefore the cheap sneer as to "the appropriators who prefer their air warmed" comes with peculiar grace from Mr. Cates under these circumstances. As his letter professes to supply the shortcomings of my paper, with special reference to a more extended historical review of the question, I wish to point out an instance of the imperfect manner in which he has carried out his intention. We have very high authority for believing that a sevenfold rate of combustion (which he evidently considers a great achievement of Mr. Fletcher's) was attained about 2,400 years before the dates he has given us, and I see no reason from Mr. Cates' point of view for ignoring the claims of Nebuchadnezzar in an historical review of the subject, especially as the fate of that monarch's amateur firemen would probably be meted out to him if he attempted to burn 100 lbs. more per foot of bar than the normal quantity with his system, and could not get out of the stokehold before his fire-doors melted, an eventuality more than probable with air admitted in the absurd manner proposed by him, as described in your issue for August, 1888. He has omitted to quote the little word "if," used by you in describing his "considerable invention," which very materially qualifies the "hall-mark of merit" your approval would invest it with in the opinion of marine engineers.

As a Bristolian I should be gratified to see a fellow-townsmen occupy that niche in the temple of fame to which Mr. Cates aspires—if he deserved it—but he should know that unworthy disparagement of the efforts of others more successful than himself is not the best way to attain his object.

J. WILLIAMS.

204, St. Andrew's Road, Birmingham.  
December 17th, 1889.

#### Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships from November 15th to December 7th, 1889.

- 19001 D. Clegg. Smoke consuming furnaces.
- 19211 T. G. Stevens. Steering-gear for ships.
- 19226 E. J. Hill. Boat lowering tackle.
- 19245 J. Cochrane & W. Cameron. Triple-expansion gear of steam or other engines.
- 19270 G. R. Murphy. Propelling, controlling, exploding and steering torpedoes.
- 19280 B. W. Maughan. Screw propellers.
- 19285 J. Campbell. Ships electrical signalling apparatus.
- 19300 G. Barnett. Apparatus for recovering sunken vessels.
- 19389 W. H. Willat. Rudder indicating apparatus.
- 19469 J. Carmichael. Telescopic lifeboats.
- 19498 Adolph I. Makarevitch. Steering-gear.
- 19580 R. Leslie. Screw shaft.
- 19602 J. Dewrance and G. H. Wall. Water gauges.
- 19659 D. Anderson. Ships' ladders.
- F. R. Lane. Propelling ships or vessels.

#### BOARD OF TRADE EXAMINATIONS.

NOTE.—1 C, denotes First Class; 2 C, Second Class.

November 23rd, 1889.

Ashley, John .. 2C Liverpool  
Atkinson, John 1C "  
Blair, Donald .. 2C Glasgow  
Brown, John C. 2C "  
Butler, John Rae 2C Aberdeen  
Christodolos, Geo. 2C Cardiff  
Criezis, Nicholas 2C London  
Cummins, Mart. 1C Cardiff  
Duncan, George 2C Aberdeen  
Ellison, John .. 2C N. Shields  
Glassford, Hugh 1C London  
Hannah, Archd. 2C Glasgow  
Henry, W. Peter 1C N. Shields  
Herington, G. H. 1C London  
Higgins, John .. 2C Glasgow  
Holt, Chas. Geo. 2C Cardiff  
Hopkins, T. C. V. 2C "  
Hunter, Adam .. 2C Glasgow  
Jack, Wm. McD. 2C "  
McDougall, Jas. 1C "  
Morris, David .. 1C Cardiff  
Morris, M. W. .. 2C Glasgow  
Price, Thos. .. 1C Cardiff  
Robertson, Wm. 2C Glasgow  
Shepherd, Alex. 1C Aberdeen  
Thompson, C. H. 1C London  
Topham, H. Geo. 2C N. Shields  
Williams, Rees 1C Cardiff  
Wright, Wm. .. 2C Glasgow

November 30th, 1889.

Armistead, Jas. 2C Liverpool  
Bird, Rich. .. 2C Sunderl'd  
Davis, A. W. .. 1C "  
Embleton, M. .. 2C N. Shields  
Halpin, John .. 2C Liverpool  
Hame, T. H. .. 2C Sunderl'd  
Hickey, Thos. .. 2C Falmouth  
Hutchinson, J. 2C Liverpool  
Jarvis, Chas. .. 2C London  
Lea, James .. 2C Liverpool  
Lees, Edwin .. 2C "  
Lewis, F. K. .. 2C Cardiff  
Lewis, John .. 1C Liverpool  
McIntire, L. .. 1C N. Shields  
Miller, C. J. .. 2C London  
Nicholson, F. .. 1C Sunderl'd  
Nicholson, J. S. 2C N. Shields  
Penn, Wm. .. 2C Liverpool  
Perry, G. T. .. 2C Cardiff  
Pill, Joseph .. 2C "  
Potts, G. W. .. 1C Sunderl'd  
Ramshaw, G. H. 2C "  
Rees, John .. 2C Cardiff  
Robb, James .. 2C Liverpool  
Rogers, D. W. 2C "  
Rugeia, C. S. .. 2C Sunderl'd  
Russell, H. .. 2C Liverpool  
Scott, Henry .. 2C Sunderl'd  
Scott, James S. 1C "  
Stallybrass, H. 1C London  
Stewart, Robert 1C Sunderl'd  
Stones, Robert 1C "  
Sutherland, A. 1C Liverpool  
Thomson, R. .. 2C N. Shields  
Venus, F. R. .. 1C "  
Watson, Chas. 2C London  
Williams, J. T. 1C "  
Wilson, R. .. 1C N. Shields

December 7th, 1889.

Black, Henry G. 2C N. Shields  
Blackwood, A. .. 1C Glasgow  
Bridger, John E. 1C Liverpool  
Carson, S. H. .. 2C Greenock

Charlton, C. J. 2C London  
Christison, D. .. 2C Leith  
Clark, Thos. .. 1C Greenock  
Colquhoun, J. P. 1C Glasgow  
Cooper, C. R. .. 2C London  
Crichton, John 2C "  
Crichton, R. .. 1C Glasgow  
Devlin, Peter .. 2C "  
Downes, Jas. H. 2C N. Shields  
Fairbairn, A. F. 1C "  
Ferguson, J. J. 1C London  
Ferguson, Robt. 1C Greenock  
Fredericks, Otto 2C N. Shields  
Hall, Wm. .. 2C "  
Harker, Wm. S. 2C "  
Haughan, L. .. 1C London  
Jeffrey, John .. 1C Leith  
King, Arthur .. 2C Greenock  
Lawson, John .. 1C Leith  
Mahoney, E. .. 2C Glasgow  
McCashell N. .. 2C Leith  
McKechnie, Jas. 2C Glasgow  
McKenna, Jas. 1C "  
McMahon, G. R. 2C London  
Morison, D. .. 1C "  
Preston, R. .. 1C Liverpool  
Reid, Duncan .. 1C Glasgow  
Rogers, Jas. J. .. 1C Leith  
Runciman, J. S. 1C "  
Sard, Evan .. 1C Falmouth  
Sawden, John .. 1C Leith  
Sjogren, C. G. V. 2C N. Shields  
Stewart, J. W. .. 1C Glasgow  
Thompson, A. R. .. 1C Liverpool  
Thompson, W. .. 1C Glasgow  
Tindall, A. .. 1C Leith  
Walker, C. L. .. 1C N. Shields  
Wallace, A. W. .. 1C London  
Wilson, David .. 1C Leith

December 14th, 1889.

Bruce, James .. 1C Liverpool  
Bull, A. B. .. 1C Dundee  
Cairncross, Geo. 1C "  
Cameron, H. M. 1C Hull  
Charley, A. S. .. 1C Plymouth  
Coleman, R. H. 2C Liverpool  
Collier, Arthur 1C Hull  
Guthill, James .. 1C Liverpool  
Davies, F. W. .. 2C "  
Davies, Wm. B. 1C Hull  
Duncan, John .. 1C London  
Ferguson, J. H. 1C "  
Forrest, D. .. 2C Dundee  
Gray, James .. 1C London  
Hall, Geo. .. 2C N. Shields  
Hitchin, John .. 2C Liverpool  
Jones, John .. 2C "  
Malmberg, C. .. 2C "  
McNaught, Jas. 1C "  
McNaughton, D. 2C Dundee  
Murphy, Jas. .. 2C Liverpool  
Murray, Chas. .. 1C "  
Myers, John G. 2C N. Shields  
Peters, Robt. J. 2C London  
Rafarel, Chas. F. 1C N. Shields  
Read, Arthur N. 2C Hull  
Richardson, S. 1C Liverpool  
Robinson, T. C. 1C "  
Rogers, John .. 2C Dundee  
Simpson, J. B. 2C N. Shields  
Sims, Alex. .. 2C London  
Swinburn, J. B. 2C Liverpool  
Turnbull, John 1C N. Shields  
Williams, J. W. 2C Liverpool  
Williams, W. H. 1C "

## The Marine Engineer.

LONDON, FEBRUARY 1, 1890.

MUCH attention is now being given to the corrosion and weakening of steel or iron plates under the action of sea water, as in the case of ships' bottoms. Professor Thomas Andrews, of Wortley Iron Works, Sheffield, has been devoting much experimental attention to the corrosion of various irons and steels by immersion in sea water. As it is probable that two or more distinct causes co-act to produce detrimental corrosion in metal plates so immersed, Mr. Andrews has very properly divided the possible causes under three distinct heads: 1st. The effect of the chemical influence of the saline constituents of the sea water upon the single plates of various metals aided by the action of carbonic acid gas, or other gases; 2nd. Such simple action may be greatly accelerated where there are bars or plates of dissimilar metals, such as wrought iron, steels, cast metals, connected together under equal conditions of circuit, and immersed in sea water, the metals thus becoming galvanic elements after the manner of the voltaic cell; and 3rdly. The electro-disintegration of the metals when long exposed in sea water. By these means certain probable but distinct deteriorating effects may be separated from each other, so as to give a guidance to inventors and others, as to suitable means for preventing such deterioration; that is, there may be in addition to the external corrosion due merely to the chemical action of the sea water, a commingling of injurious effects by the passing of electric currents between the dissimilar metals, which may not only increase the external corrosion or pitting of the metals, but at the same time may actually cause internal disorganisation of the metal tending to destroy its strength by an alteration of the structure due to the passing of constant electrical currents. Upon these various causes of deterioration Mr. Anderson has made experiments upon wrought iron, steel, and cast metals, with the following results: In 24 hours, bubbles formed upon the wrought iron, Bessemer steel and soft bars remaining free from bubbles. In 46 hours the bubbles disappeared from the wrought iron rod, and oxidation had commenced rapidly in this bar, and in all the others with the exception of the puddled steel. The rate of corrosion rapidly increased as time proceeded from the commencement of the experiment, the increased corrosion during the second year amounting to 50

per cent. above that of the first, the plates (more especially when made of steel) after two years and ten weeks' exposure, emitting a very distinct odour of carburetted hydrogen, owing probably to the disassociation of the carbides of the steel from the chemical action of the sea water. As regards the total results, the lower the percentage of combined carbon the less is the corrosion, the best scrap iron corroding for the whole period much less than the steels for the same time.

AN excess of manganese seems liable to produce increased corrosion, because it tends to produce local action from its uneven distribution throughout the metals. The total loss in weight for 20 weeks by simple corrosion seems to have averaged from 1.2 to 1.6 per cent. With regard to the effect of galvanic corrosion, the plates, when connected in metallic circuits, showed fine streaks of pale coloured oxide of iron within five to ten minutes. At first the corrosion seems to have been greater with the wrought iron than with the steel when coupled as a galvanic pair, but at the end of 112 days the loss was greater in the case of the steels, indicating that a reversal of electro-chemical position had taken place. The total corrosion when the galvanic current is present in the period of 147 days in the case of the steel bars averaged from 1.5 to 3 per cent., the latter in the case of hard cast steel. The wrought iron showed a loss at an average of 1 to 1½ per cent. The whole of the plates when taken out after long exposure were found to be covered with soft, slimy oxide of iron, the upper half of each plate having an appearance of rust, the lower part was completely blackened, and black corrosive sediment was found at the bottom of the tanks. With regard to the electric-disintegration of the metals in sea-water, long exposed to electric currents of varied and known intensity, in the case of galvanic action between copper and wrought iron, the wrought iron under these conditions corroded more than most of the steels during 16 weeks' exposure, to an average electric force of .013 volt, but when the metals were under the action of a much higher electro motive force (nearly 4 volts) the wrought iron had the advantage over the steels, with the exception of hard Bessemer, from which it would appear that wrought iron is less acted upon in sea-water by electro-motive force than steels; but the appearance of the corroded plates on withdrawal from the sea-water indicated that in the case of the soft or semi-soft steels, the

work of destruction emanated from the number of nuclei or centres, the metals were generally indented and honeycombed locally, they also exhibited gaps near the bottom of the plates. The corrosion in the case of the wrought iron seemed more uniformly distributed over the whole surface. A microscopic examination of the interior of these deep cavities in the steel with a good light reflected thereon revealed the mode in which the interior of the metal was attacked by the sea-water under the condition recorded. From the preceding experiments it will be seen that the simple and galvanic corrosion of all metals in sea-water is considerable, though the galvanic action would appear to be reduced in course of time owing to the protection of rust. The increased corrosion caused by galvanic currents show the importance of guarding against accidental galvanic action in construction. As far as the question of corrosion generally is concerned, the behaviour of neither iron nor steel is as satisfactory as might be desired. Of course a greater protection against galvanic corrosion would exist in a perfect protection of the outer shell of a vessel from galvanic action, and in dealing with this subject the late covering of a Russian man-of-war with lacquer as a means of isolating the plates and of preventing the corrosion of electric currents is a very interesting experiment. In the same way a claim has been made by Messrs. Holzapfel & Co., that a soap-stone composition has an equally beneficial effect, and we should be glad for our readers to interest themselves in this subject and aid scientific analysis and investigation into it by giving us the benefit of such results as may happen to come under their notice.

THE practice of torpedo discharge is still very much in its infancy, although vessels have been designed and fitted to discharge torpedoes from the side, it has been found in practice that this is not feasible beyond a certain speed. Now as it is considered that speed is an essential in such lightly armed vessels as torpedo vessels, we are here met with a most discouraging difficulty. This difficulty has been well exemplified in the trial of the cruiser *Mersey*. Beyond a moderate rate of speed it has been found impossible to shoot the projectile free of the side in consequence of the vibration which is set up by the pressure of the water upon the projecting guides. An improvement has been introduced to withdraw the guides between discharge, but this does not ameliorate the difficulties at

the moment of discharge. When running at nearly full speed, the torpedo either jammed in the guide bar or escaped in a more or less damaged condition. Mr. Phillip Watt has tried to get over the difficulty by floating the projectile in a recess cut in the ship's side before the expulsion. Captain May invented a method of suspending it by means of merry tongs until it had been run clear of the ship and then allowing it to escape. So far as we have heard neither of these arrangements have proved successful. It would appear to us that serious thoughts have yet scarcely been taken to tackle this obvious difficulty. There are two directions which we think are an improvement in side torpedo firing. Either the torpedo guides must be entirely protected externally against the rushing water pressure, or a curved torpedo, a part of a circle, might be used with a circular delivery tube, which admitting of first discharge in the direction of the axis of the ship would enable the torpedo to maintain a circular course until she might impinge perpendicularly upon the side of an enemy's ship running in a course parallel to the torpedo vessel. There is here a good field for our inventive readers.

IN spite of the enlarged number of applications of forced draught in the Navy or elsewhere, there seem to be so many breakdowns in practice that the system as at present generally fitted is somewhat discredited. The Admiralty have authorised Mr. W. A. Martin, of Blackfriars Road, to carry out a series of experiments at Portsmouth with a new system, of which he is the inventor. A pair of old locomotive boilers will be used for the purpose, and a powerful blast is used in the funnel, while the ash-box under the grate collects an unlimited supply of air, which is sucked up evenly through the tubes. This is an old application to locomotives who are generally fitted with blast pipes in the funnel to blow up a black fire. Mr. Martin's theory is that the forcing of the air under the fire-bars into the fire-box brings such a concentrated effect upon the tube-plate that it is certain sooner or later to produce leakage and burning by driving the protecting water away from the heating surface. This adoption of a suction theory to the entire displacement of the pressure feed is but a very simple change of face, but may produce very considerable practical effects. For instance, there can be no danger whatever of excessive heat or flames being forced out of the fire-door to the danger of the stoker, as is the case with forced blast. Mr. Mart

also proposes to substitute a fan for the blast if necessary to provide a heavy draught, but always on the principle of induction.

### INSTITUTE OF MARINE ENGINEERS.

A MEETING of the Institute was held on the 13th January, when a paper on "The Marine Engine considered as a Machine" was read by Mr. J. G. Hawthorn.

The meeting was specially for the junior engineers and graduates, and was presided over by Mr. J. D. Churchill.

Mr. Hawthorn began by pointing out the importance of mathematics to the engineer who wished to understand the leading principles underlying the structural arrangements of the engine, as well as those involved in proportioning the strength of the various parts. The conversion of the motion of the piston and piston-rod into that of the crank-shaft being the primary object was then referred to; and the power exerted by the piston when impelled by the force of the steam was considered, and the losses due to resistance and friction consequent upon the change of motion from reciprocating to rotary were pointed out. The guides and guide-shoes, the cross-head and connecting-rod motions, and the several and appointed duties of these details were referred to and discussed, as well as the forces at work acting to give the change of motion; this was illustrated by a diagram of the parallelogram of forces and the direction of the resultant. The turning effort on the crank-shaft and the strain on the material of the shaft at various parts of the stroke were illustrated, and the formulæ for calculating the diameter of the shaft was shown reduced to its elements and analysed. The transmission of the motion from the crank-shaft to the propelling apparatus by and through the intermediate shafting and coupling bolts was next dealt with, and the shearing strain on the bolts with the method of determining the section of iron or steel to resist fracture and ensure safety was pointed out. The duty of the propeller, the effective and resisting forces at work in the propeller itself, as well as the vessel to be propelled, were analysed, and the net power available for moving the vessel through the water at a certain rate of speed was resolved from assumed data. The power expended in working the pumps, especially the circulating pump, was shown and illustrated by an example worked out from rules and assumed data, and the lecturer closed by expressing a hope that he had given some ideas which might be productive of good to some of the juniors present, and although he made no claim to originality in what he had put before the meeting, he wished to interest and draw out the younger members and graduate section of the Institute and lead them to think about the theoretical as well as the practical side of their business. Some valuable hints were given, also simple formulæ and illustrations by Mr. J. Mc. F. Gray, followed by remarks from other speakers, and the proceedings were brought to a close by Mr. Winterburn proposing and Mr. Brett seconding a vote of thanks to the author of the Paper, in the course of which the former referred to the difficulty he had experienced in trying to master the Differential Calculus which had been so highly eulogised by Mr. Mc. F. Gray as simple and most useful to every engineer; being a junior, he was most anxious to move forward with the times, and had listened with pleasure, and he hoped with profit, to the paper. Mr. Brett considered that, speaking as a junior, the majority of books which were published dealt with too many complex mathematical formulæ, which could be much better shown in simple arithmetic formulæ and would at the same time be much better understood by the majority of young engineers. Mr. Leslie proposed and Mr. Gale seconded a vote of thanks to the chairman, who suitably responded.

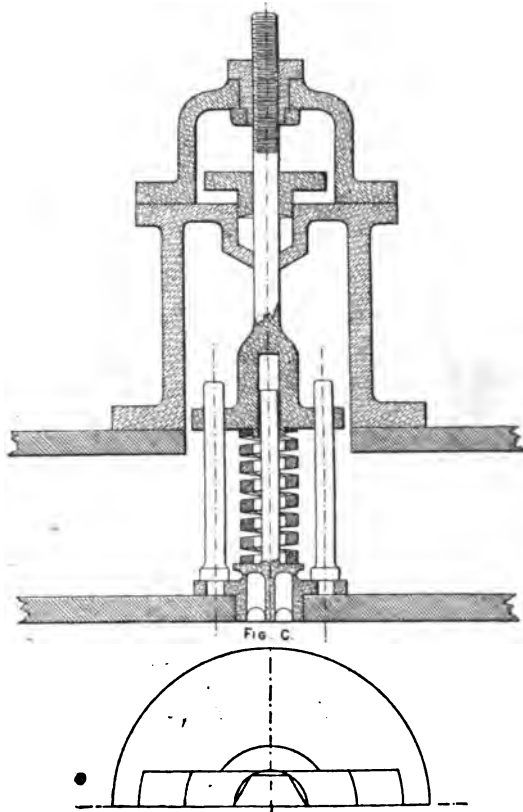
The Honorary Secretary then announced that it had been arranged—subject to the approval and arrangements of the author—that the next Paper would be read on Friday January 31st, at 7.30 p.m. by Mr. Sommerville (Chief Engineer, P. and O. Steam Company) who was expected to arrive in port during the week, and who had prepared during the voyage a paper on "Ventilation of Engine Rooms and Stokholds in the Tropics."

### THE CONSTRUCTION OF MARINE BOILERS WITH A VIEW TO THE USE OF HIGHER PRESSURES.\*

By CHARLES BASTOW CASEBOURNE.

IN placing before the members of this Institution a design of a new form of boiler suitable for higher pressures of steam than those now in general use, it would be as well for the writer, before explaining the design, to point out the many advantages, in his opinion, that would accrue from the use of higher pressures.

During the last four or five years the struggle for economy has been marked by the extensive adoption of the triple expansion or tri-compound engine, working at pressures from 140 to 180 lbs. This type of engine has been almost exclusively adopted in new vessels, and in many instances compound engines have been converted into triple expansion by the addition of a third cylinder and higher pressure boilers.



And here it may be stated that before the introduction of this class of engine, 80 lbs. was the most generally adopted pressure.

The well-known Trevithick was the first engineer to introduce steam of high-pressure; and although his engines were non-condensing and his boilers of poor construction, yet he successfully proved their superiority in economy of fuel over the low-pressure engine, thus showing that steam of high pressure could be used advantageously; and when he and Woolf joined together in introducing the compound engine it is said they used steam of 60 lbs. pressure.

Steam of higher pressure than he ever anticipated is now being used, both with land and marine engines, and the object of this paper is to attempt to prove that steam of still greater pressures than those now generally adopted may be used with economical results, and that with few alterations the present type of marine boiler may be adapted to safely withstand these higher pressures.

\*Paper read before the North-East Coast Institution of Engineers and Shipbuilders.

The superiority of the triple expansion engines over the compound is due to the following causes:—

To the higher pressure of steam used, and the higher rate of expansion consequent.

Great variation of temperature in the cylinders, great initial strains, and sudden "drops" in the receivers are thereby avoided.

These apply also to quadruple expansion engines. Increased pressure of steam is easily obtained by a very slight addition in the consumption of fuel, and the efficiency of steam rapidly increases with the increased pressure.

This may be proved:—

1. The total heat of evaporation of 1 lb. water, from 100° F. and at 312° F. (80 lbs. absolute) is 1108·6° F.
2. The total heat of evaporation of 1 lb. water, from 100° F. and at 358° F. (150 lbs. absolute) is 1122·4° F.
3. The total heat of evaporation of 1 lb. water, from 100° F. and at 401·1° F. (250 lbs. absolute) is 1135·3° F.

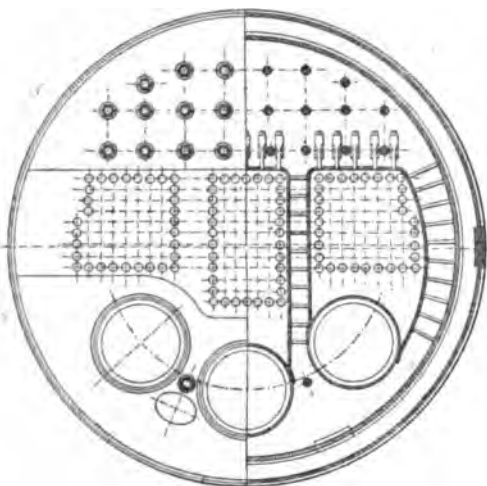
If in each case the steam be expanded to a terminal pressure of 10 lbs. absolute, the ratios of expansion will be (1) 8, (2) 15, (3) 25, and the mean pressures corresponding to these initial

tainty that a saving of 20 per cent. would be effected over the triple-expansion engine. At the present time quadruple-expansion engines are working at a pressure of 180 lbs. only. This is accounted for by the fact that hitherto it has not been found possible to construct a marine boiler capable of withstanding a higher pressure without either considerably reducing the diameter or increasing the thickness of the shell plates.

With respect to the reduction of the diameter, it may be generally known that boilers of the locomotive type have frequently been tried, and many engineers are looking to this class of boiler as offering some advantages in point of weight in comparison to marine boilers, as well as their adaptability for higher pressures. Their performances have, however, not been found satisfactory, and in many instances where large boilers of this type have been in use they have had to be taken out and replaced by the ordinary type of marine boiler.

Two of the principal objections to the locomotive boiler for marine purposes are:—

*Firstly.*—That they require the purest water, as from their construction they are much more difficult to clean and scale than an ordinary marine boiler.



— Fig. A —

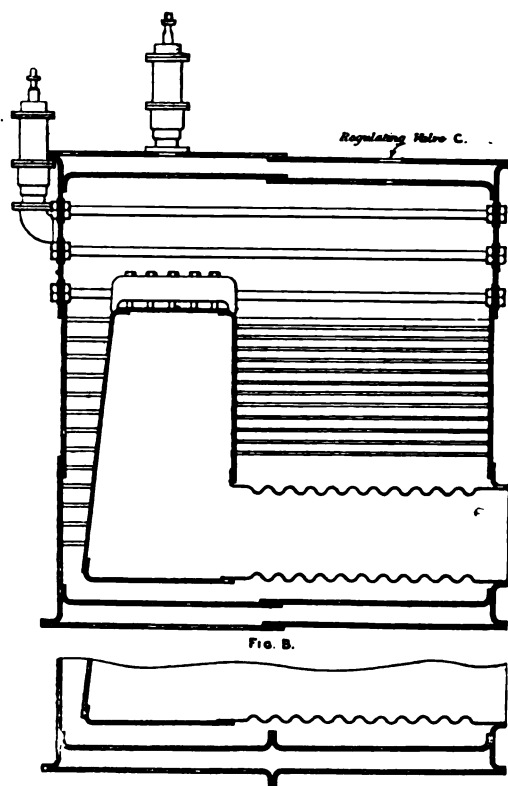


Fig. B.

pressures and rates of expansion will be (1) 30·7, (2) 37·08, (3) 45. If the volume of steam varied exactly as the inverse ratio of the pressure, then these figures would give the comparative values of the steam at the pressures indicated. But as the volume of steam does not vary exactly as the inverse ratio of the pressures, the following will be found to be the more exact relative values in whole numbers: (1) 31, (2) 39, (3) 47.

From this it will be seen that steam of 250 lbs. is capable of doing 20 per cent. more work than steam of 150 lbs., and steam of 150 lbs. 25 per cent. more work than steam of 80 lbs. The latter has been proved by actual practice, and is now an acknowledged fact.

To use steam of 150 lbs. pressure with a compound engine would be very little more economical than to employ steam of 80 lbs., and the same may be said in the case of using any higher pressure than 160 lbs. for triple-expansion engines. Yet when 160 lbs. pressure is used in the case of triple-expansion engines, it may be said that there is a saving of 25 per cent. over the ordinary compound; and supposing a boiler was adopted of this pressure it might be anticipated with some cer-

*Secondly.*—They are apt to prime, owing to the small diameter and limited steam space, whenever the vessel is rolling and pitching in a seaway.

Again, the writer questions very much whether this type of boiler, if required for a certain horse-power, could be made to occupy the same space of boiler room as a marine boiler of the same horse-power.

In a paper read before the Institution of Naval Architects by Mr. W. Parker, March 27th, 1885, he says:—"I have conferred with the principal steel makers in the kingdom on this subject, and am able to say that they agree with me and are decidedly of opinion that steel shell plates of over an inch in thickness, and having a tenacity of over 30 tons, must contain so much carbon as to render them unsuitable for boiler-making purposes, although they may possess the necessary tenacity and ductility to withstand the usual tensile and cold bending tests."

Since this paper was read the uniform quality of steel plates for boiler making has considerably improved, and they are now able to turn out plates up to 1½ and 1¾ inch thick, but this is about the limit.

Mr. J. T. Milton also remarks in a paper read before the

same Institution, March 30th, 1882:—"That these pressures of 140 and 180 lbs. are not likely to be increased for some time to come, unless some type of boiler is introduced which will not necessitate the present style of casing for containing the steam and water, nor the present method of internal firing, as with the obtaining pressures the thickness of plates for these portions have reached the maximum capable of being worked on the one hand, and of being used for the transmission of heat on the other." Taking these matters into consideration it would appear that before higher pressures can be adopted some improved type of boiler is necessary to withstand these higher pressures which must be so constructed, that shell plates of excessive thickness are not required, nor has the diameter of boiler to be reduced.

Having regard to these requirements the writer ventures to introduce to your notice a form of boiler which will bear the strain of these higher pressures without increasing the thickness of shell plates, or reducing the diameter. In the accompanying sketch it will be seen that Fig. A is a boiler having two shells, which will hereafter be named as "outer" and "inner" shells. The space enclosed between the shells is termed a "jacket," so that the whole may be termed a "jacketed" boiler. The object of providing a double shell is to charge the enclosed space with steam of a lower temperature than that generated within the inner shell, which is thus relieved of the full pressure of steam within, and is only subjected to the excess of the pressure of steam within, over the pressure of the steam between the two shells. As for example—in the sketch we have a boiler with a shell calculated to stand a working pressure of 150 lbs. to the square inch, employed as the inner shell of a boiler in which steam is generated to a working pressure of 250 lbs., the extra 100 lbs. being neutralised or balanced by an external pressure of the same amount exerted by the steam enclosed between the two shells or jacket.

As the object of providing a space between the two shells is to provide a means of applying a neutralising or balancing pressure to the inner shell, any fluid or gaseous body may be used, but for many obvious reasons steam is the most convenient for the purpose.

It is at once evident that the pressure in the jacket must be constantly and regularly maintained, and in order to provide for this it is necessary to have one or more regulating valves between the two shells. These are constructed on the principle of an ordinary spring-loaded safety valve mounted on valve seats in the inner shell, and so regulated that when the pressure in the jacket falls below that required to be maintained, the valve lifts admitting steam from the boiler until the required pressure is reached, when the valve again closes. The valve in the sketch is loaded to 150 lbs., and is externally adjustable. This is effected by having a screwed spindle passing through the cover by means of which the spring may be compressed or released as desired. A valve similar to Fig. C would be necessary to provide against collapse of inner shell, should the pressure in boiler from any cause be suddenly reduced. Safety valves of ordinary construction would have to be provided for both boiler and jacket. Condensed water would be drawn away from bottom of jacket to feed pumps. Tubes would have to be thicker, but not much more so than those required for 150 lbs. pressure, as their diameter could be slightly reduced.

The same may be said of furnaces. These could be used of a thickness of  $\frac{3}{4}$  inches and diameter of 3 feet, and of a thickness of  $\frac{3}{4}$  inches and diameter of 2 feet 6 inches, of Fox's patent corrugated type. Longitudinal stays would have to be pitched closer together and of rather larger diameter, but they need not be of lesser pitch than 14 inches, which would afford ample room for examination and cleaning inside of boiler. Combustion chamber stays would have to be pitched closer together and of rather larger diameter.

Tube plates need not be of any excessive thickness, if more screwed stay-tubes are put in. In fact, there seems to have been plenty of room for adapting the present style of marine boiler to higher pressures, in all directions with the exception of the shell, and the writer is of opinion that the double form of shell, as shown in sketch, would overcome this difficulty. Although a boiler with two shells will naturally weigh more than a boiler with one, yet the extra weight will not be so much as might at first be supposed, for by using steam of higher pressure a boiler of smaller diameter is possible, the weight of water evaporated being less. In Fig. B, it will be seen that two forms of rivetted circumferential seams are shown, one the ordinary lapped joint double rivetted and the other a flanged joint, flanged externally in the case of the

"outer" shell and internally in the case of the "inner" shell.

The latter form of joint has been suggested in event of any difficulty being experienced in repairing an ordinary lap joint should occasion rise.

It has been previously mentioned that this type of boiler is specially adaptable for steam of 250 lbs. for quadruple expansion engines which are at present only using steam of 180 lbs.

This class of engine is becoming more popular every day, and may in time supersede the present triple expansion, even as the latter has taken the place of compound engines.

The writer has not thought it necessary in this paper to go into all the minor details of a new design of boiler, but is anxious to have an expression of opinion from the engineering members of this Institution as to the feasibility of constructing a marine boiler with a double shell to stand much higher pressures than those now in actual use.

### THE SLOOP-OF-WAR "BASILISK."

AN important addition has been made to the effective strength of the Royal Navy by the completion for sea at Sheerness dockyard of the new sloop-of-war *Basilisk*, which has been built and equipped at a cost of about £72,500. The *Basilisk* is built upon similar lines to the *Buzzard*, serving on the West Indies Station, except that the latter ship was built in composite fashion, with steel frames and two thicknesses of teak, while the *Basilisk* has a complete steel bottom, and this is sheathed with one skin of teak,  $3\frac{1}{2}$  in. thick, and extending 2 ft. above the water-line. The *Basilisk*, which has been built from the designs of Mr. W. H. White, Director of Naval Construction, was begun in May, 1888, and has therefore been 19 months in the dockyard hands. She is 195 ft. in length, 30 ft. in breadth, and has a displacement of 1,170 tons. She has been fitted with triple-expansion engines of 2,000 H.P. supplied by Messrs. J. and G. Rennie & Co., which at her recent machinery trials worked in a very satisfactory manner, developing a speed of  $14\frac{1}{2}$  knots under forced draught and 13.5 knots under natural draught. The *Basilisk* is equipped with eight 5 in. steel breech-loading guns, two of which are mounted on the poop, two on the forecastle, and four amidships. She also carries an auxiliary armament of eight Gardner and Nordenfeldt machine guns, which are mounted in various parts of the ship. The *Basilisk* is barque-rigged, and it is expected she will shortly be commissioned for service on the East Indies Station.

### A NEW COOLING CHAMBER.

THE Harden Star, Lewis & Sinclair Company, of 114, Cannon Street, London, invited us the other day to inspect the efficiency of a new cooling chamber, invented by Messrs. Hill & Sinclair, which forms quite a new departure in refrigeration and ice-making. The apparatus is a simple and cheap one, and consists of a slow combustion stove, by which steam is generated for heating a strong solution of ammonia, which is contained in an iron cylinder. The ammonia is separated from the water by the heat of the steam pipes, and it ascends as vapour or gas to a separator, where it is deprived of all traces of moisture, the separator being surrounded by cold water. The gaseous ammonia then passes on to a water-cooled condenser, where it becomes liquified by its own accumulated pressure, due primarily to the heat applied to the solution in the boiler, and further to the abstraction of its sensible and latent heat by the cold water which circulates around the condenser. From the condenser the ammonia gas is conducted to the refrigerator, which forms the roof of the cooling room. This refrigerator consists of a tank, which is filled with strong brine in sufficient quantity to store up the cold required. The ammonia gas is contained in a cylindrical chamber, which is immersed in this brine. The walls of the cooling chamber are a double casing of wood, the intervening space being filled in with non-conducting material. The bottom of the tank, which, as we have said, forms the ceiling of the room, being of the same temperature as the brine, which is cooled to any required degree above or below the freezing point, transmits the cold to the chamber. As t'

coldest air descends to the bottom, a constant circulation is automatically kept up, thus drying the air and maintaining the temperature in a favourable condition. After the required degree of cold has been obtained, the temperature is perfectly under control. The manufacture of ice can also be carried on by means of this apparatus, and at the same time as the cooling process. During our inspection, the efficiency of the cooling room and its economy in use were amply demonstrated, and it was shown that after the door had been opened for removing the contents and again closed, the temperature rapidly recovered itself.

### LLOYD'S REGISTER SHIPBUILDING RETURNS.

QUARTER ENDED 31st DECEMBER, 1889.

FROM the returns compiled by Lloyd's Register of Shipping, it appears that, excluding warships, there were 521 vessels of 872,957 tons gross under construction in the United Kingdom at the close of the quarter ended 31st December, 1889. The particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1888 for the purpose of comparison:—

Description.	31st December, 1889.		31st December, 1888.	
	No.	Gross tonnage.	No.	Gross tonnage.
<b>STEAM.</b>				
Steel .. .. .	384	753,209	312	694,386
Iron .. .. .	51	30,321	48	85,157
Wood and composite ..	3	1,000	4	255
<b>Total .. .. .</b>	<b>438</b>	<b>784,530</b>	<b>364</b>	<b>729,798</b>
<b>SAIL.</b>				
Steel .. .. .	45	78,283	35	65,116
Iron .. .. .	6	7,700	7	13,196
Wood and composite ..	32	2,444	39	8,358
<b>Total .. .. .</b>	<b>83</b>	<b>88,427</b>	<b>81</b>	<b>81,670</b>
<b>Total Steam and Sail ..</b>	<b>521</b>	<b>872,957</b>	<b>445</b>	<b>811,468</b>

From the above statement it will be observed that the merchant tonnage under construction in the United Kingdom at the end of 1889, was about 8 per cent. greater than the tonnage under construction at the end of 1888. During the past year, however, the amount of work in hand increased until the end of the second quarter, when there were 536 vessels of 929,611 tons under construction, these being the highest figures reached since the period of unprecedented activity in 1881-83. Since June last the returns have shown a slight falling off. The September returns showed 46,862 tons less than those for the previous quarter, and the present returns show 9,792 tons less than those for September. On the other hand, an increase is noticeable this quarter in the vessels for the construction of which preparations are being made, there being now 171 vessels of 304,275 tons "preparing," against 125 vessels of 242,800 tons, at the close of the previous quarter. It should be added that, of the vessels under construction in the United Kingdom at the end of December, 434 vessels of 769,453 tons, or approaching 90 per cent., were being built under the supervision of the surveyors of Lloyd's Register with a view to classification by that society.

The following details concerning the vessels included in the foregoing statement are necessary in order to represent properly the shipbuilding work of the past three months:—

During quarter ended 31st December, 1889.	STEAM.		SAIL.	
	No.	Gross tonnage.	No.	Gross tonnage.
Vessels commenced .. .	182	303,333	33	41,600
Vessels previously commenced but not progressed with .. .	5	360	8	501
Vessels launched .. .	168	317,953	18	34,588

It may be noted here that during the year 1889 there have been launched in the United Kingdom, 595 steamers of 1,083,793 tons, and 95 sailing vessels of 125,568 tons, or a total of 690 vessels of 1,209,361 tons. The following table apportioned the vessels now under construction in the United Kingdom to the countries for which they are being built:—

Country for which intended.	STEAM.		SAIL.		Total.	
	No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
United Kingdom	309	553,347	53	57,984	362	611,331
British Colonies	16	31,980	—	—	16	31,980
Denmark .. .	2	1,238	—	—	2	1,238
France .. .	8	13,050	2	6,800	10	19,850
Germany .. .	16	45,988	4	7,300	20	53,288
Greece .. .	1	2,560	—	—	1	2,560
Holland .. .	2	7,000	—	—	2	7,000
Italy .. .	4	6,352	—	—	4	6,352
Japan .. .	1	1,900	—	—	1	1,900
Mexico .. .	1	350	—	—	1	350
Norway .. .	12	11,600	—	—	12	11,600
Portugal .. .	1	3,540	—	—	1	3,540
Roumania .. .	1	2,350	—	—	1	2,350
Russia .. .	3	4,590	—	—	3	4,590
South America ..	6	8,520	—	—	6	8,520
Spain .. .	4	8,774	—	—	4	3,774
For sale, and nationality of owners not stated .. .	51	91,891	24	16,343	75	107,734
<b>Total .. .</b>	<b>438</b>	<b>784,530</b>	<b>83</b>	<b>88,427</b>	<b>521</b>	<b>872,957</b>

It will doubtless be of interest to give the total figures for vessels under construction, at the principal shipbuilding centres of the country, now as compared with those for the same period last year:—

District.	Description.	31st December, 1889.		31st December, 1888.	
		No.	Gross tonnage.	No.	Gross tonnage.
Belfast and Londonderry..	Steam ..	20	62,745	19	67,790
	Sail ..	6	7,432	4	5,240
	<b>Total ..</b>	<b>26</b>	<b>70,177</b>	<b>23</b>	<b>73,030</b>
Clyde .. .	Steam ..	124	225,121	91	201,920
	Sail ..	27	49,111	23	45,606
	<b>Total ..</b>	<b>151</b>	<b>274,232</b>	<b>114</b>	<b>247,526</b>
Mersey .. .	Steam ..	11	10,320	12	23,932
	Sail ..	7	9,120	7	10,975
	<b>Total ..</b>	<b>18</b>	<b>19,440</b>	<b>19</b>	<b>34,907</b>
Tees .. .	Steam ..	56	108,261	46	105,744
	Sail ..	1	2,360	—	—
	<b>Total ..</b>	<b>57</b>	<b>110,621</b>	<b>46</b>	<b>105,744</b>
Tyne .. .	Steam ..	73	157,033	72	147,384
	Sail ..	1	150	—	—
	<b>Total ..</b>	<b>74</b>	<b>157,183</b>	<b>72</b>	<b>147,384</b>
Wear .. .	Steam ..	63	141,399	53	110,138
	Sail ..	1	1,390	2	2,626
	<b>Total ..</b>	<b>64</b>	<b>142,789</b>	<b>55</b>	<b>112,764</b>

### FOREIGN SHIPBUILDING.

The following table shows the number and tonnage of vessels, excluding warships, under construction at various foreign ports according to the latest returns which have been received at this office. Vessels of less than 100 tons are not included in these figures:—

Country.	District.	Date of return.	Steam.		Sail.		Total.	
			No.	Gross tonnage.	No.	Gross tonnage.	No.	Gross tonnage.
			1889.					
Austria	Trieste	Dec 31	2	820	—	2	820	
Belgium	Antwerp	Dec 31	3	3,000	—	3	3,000	
China	Shanghai	Nov 15	1	550	—	1	550	
Denmark	Copenhagen	Dec 31	12	9,714	—	12	9,714	
France	Binic & Paimpol	Sep 27	—	—	2	255	2	255
	Dunkirk	Sep 30	—	—	1	120	1	120
	Havre	Dec 23	3	900	—	3	900	
	Nantes and St. Nazaire	Aug 20	5	14,140	2	2,200	7	16,340
Germany	Bremerhaven, Vegesack, Geestemünde	Dec 21	7	9,720	8	9,248	15	18,968
	Hamburg, Flensburg, and Kiel	Dec 31	18	26,585	—	18	26,585	
	Rostock, Lübeck & Stettin	Oct. 1	16	23,770	1	1,300	17	25,070
	Danzig	Sep 28	2	981	—	2	981	
Holland	Amsterdam	Dec 24	5	5,053	1	1,200	6	6,253
	Rotterdam	Sep 26	6	4,050	—	6	4,050	
	Various other ports	Sep 26	10	10,410	2	2,300	12	12,710
Italy	Genoa	Dec 31	4	7,800	30	25,140	34	32,940
New Brunswick	St. John	Dec 31	—	—	4	2,424	4	2,424
New Zealand	Auckland	Nov 11	—	—	2	small	2	small
Norway	Bergen, Christiania, Christiansand, Drontheim, & Stavanger	Dec 20	22	11,771	1	1,550	23	13,321
Prince Edward Island	—	Dec 16	—	nil.	—	nil.	—	nil.
Sweden	Gothenburg, Oscarshamn, and Thorskögen	Dec 31	13	7,686	—	13	7,686	
	Stockholm	Dec 20	4	2,150	—	4	2,150	
	Baltimore	Dec 20	1	1,500	1	700	2	2,200
United States of America	Philadelphia, Camden, Chester, and Wilmington	Dec 20	21	29,840	4	2,480	25	32,320
	San Francisco	Sep 30	2	small	1	small	3	small

LLOYD'S REGISTER OF SHIPPING,  
2, White Lion-court, Cornhill, E.C.

January, 1890.

## JUMPING A TORPEDO-BOAT OVER A BOOM

ON Tuesday morning, January 21st, an interesting experiment in jumping a torpedo-boat over a boom was carried out in Porchester Creek by the officers of the *Vernon*. The boom, which was 20ft. in length, differed from the usual spars which are used for the defence of harbours against torpedo attacks, in that it was 6ft. broad and surmounted by a number of spikes, which it was supposed would receive the boat and hold it a prisoner. No 49 first-class torpedo-boat, which had been strengthened for the purpose, was selected to attack the boom. Having made a few preliminary runs in the harbour to enable her engines to obtain full speed, she made a dash at the boom at a rate of about 20 knots. At this speed her stern was lifted out of the water almost as high as the boom itself which sunk on impact, and before it could rise to the surface the momentum of the craft had carried her over. She was subsequently berthed in No. 1 dry dock, and it was found that neither her cut-water nor propeller had suffered in the least, nor had a single plate been bulged or started. The result of the experiment goes far to show that either the booms must be duplicated or that they must be supplemented with nets, with the object of entangling the screws of the attacking boats.

## LIST OF BRITISH MEN-OF-WAR LAUNCHED IN 1889.

Name.	Tons.	Horse-power.	Speed.	Cost.
Blake	9,000	20,000	22 knots	£430,658
Vulcan	6,620	12,000	20 knots	292,107
Barham	1,830	6,000	19.5 knots	101,408
Blanche	1,580	3,000	16.5 knots	96,937
Blonde	1,580	3,000	16.5 knots	96,937
Barrosa	1,580	3,000	16.5 knots	96,937
Barracouta	1,580	3,000	16.5 knots	96,937
Basilisk	1,170	2,000	14.5 knots	67,632
Beagle	1,170	2,000	14.5 knots	67,632
Widgeon	805	1,200	13.5 knots	45,678
Redpole	805	1,200	13.5 knots	45,678
Goldfinch	805	1,200	13.5 knots	45,678
Lapwing	805	1,200	13.5 knots	45,678
Ringdove	805	1,200	13.5 knots	45,678
Magpie	805	1,200	13.5 knots	45,678
Redbreast	805	1,200	13.5 knots	45,678
Sparrow	805	1,200	13.5 knots	45,678
Thrush	805	1,200	13.5 knots	45,678
Wizzard	735	4,500	21 knots	58,000
Whiting	735	4,500	21 knots	58,000
Salamander	735	4,500	21 knots	58,000
Seagull	735	4,500	21 knots	58,000
Sheldrake	735	4,500	21 knots	58,000
Skipjack	735	4,500	21 knots	58,000
Spanker	735	4,500	21 knots	58,000
Speedwell	735	4,500	21 knots	58,000

To these may be added 13 first-class and 10 second-class torpedo boats, supplied by Yarrow, Thornycroft, White, and a Paisley firm, for the Navy, and the Pandora and four sisters, of 2,575 tons and 19 knots speed, for Australia.

## NEW MAIL STEAMER FOR THE UNION STEAMSHIP COMPANY.

ON Wednesday, January 22nd, Messrs Day, Summers & Co., of the Northam Iron Works, Southampton, launched a new steamer for the Union Steamship Co. The vessel is of the following dimensions:—Length, between perpendiculars, 260 ft.; breadth, 33 ft.; depth in hold to awning deck, 24ft. She has been built of steel to class 100 A1 at Lloyd's under special survey, but the scantlings have been largely increased beyond Lloyd's requirements. The vessel has been specially designed for the Union Steamship Co. trade between Table Bay and Natal, and is fitted with every modern convenience for the comfort of a large number of first, second and third-class passengers, and the speedy loading and discharging of cargo, and is fitted with water ballast in fore-peak and in main and after holds.

The awning deck, which is of teak and extends all fore and aft, forms a long promenade deck, the boats being stowed on beams overhead, leaving the deck clear.

At the fore-end there is a topgallant fore-castle deck, which affords accommodation for the crew and at the same time forms a house for the protection of the steam-windlass, and a platform for working the anchors, hawsers, &c.

The saloon, which is on the main deck in front of the machinery space, extends from side to side of the vessel and is handsomely fitted up with tables and revolving chairs for forty first-class passengers. The walls of this saloon are tastefully decorated with ornamental carved work in various designs, while abundant light and ventilation is obtained from the sidelights and an elegant skylight overhead.

The first-class sleeping cabins are placed forward of the saloon on the main deck and are fitted with patent wire-woven spring folding-up berths and patent mahogany folding-up lavatories which while being exceedingly convenient, occupy the smallest amount of space. They are also fitted with electric light and electric bells, &c., &c.

The second-class saloon and sleeping cabins have been arranged abaft the machinery space on the main deck, the fittings of the sleeping cabins being identical with those of the first-class cabins.

The steering gear is Napier's patent combined steam and hand steering gear, placed directly over the rudder-head.

There are no chains or quadrant to give any trouble, the steam gear is perfectly noiseless, while the hand gear is the most powerful that is made, the power increasing as the rudder goes over.

The windlass is Clark, Chapman & Co.'s patent. The chain cables are in excess of Lloyd's requirements. The steam winches, three of which are fitted, have also been supplied by Messrs. Clark, Chapman & Co. They are of large and powerful make, capable of lifting heavy weights. The ventilation of the ship has received special attention. The vessel is being fitted throughout with electric light by Siemens Bros. & Co.

The engines are on the triple-expansion principle, with three cranks, and are fitted with all the latest improvements.

The cylinders are 21 in., 34 in., and 57 in. in diameter by a 36 in. stroke, working pressure 160 lbs. per square inch; the cylinders are fitted with liners and steam-jacketed.

The shafting throughout is of Vicker's steel, and extra large in diameter.

The piston and connecting rods and all the forgings are of steel.

The engines are fitted with steam-reversing gear and steam turning gear, which can also be worked by hand.

The surface condenser has a cooling surface of 2,200 square feet.

The air pump is worked by levers connected to after engine, and is fitted throughout with Beldam's corrugated valves.

There are two centrifugal circulating pumps, with separate engines, by Gwynne, each capable of supplying the condenser with the requisite quantity of water; these pumps are also arranged to draw water from the bilges of the ship.

Three large and powerful donkey engines, by Cameron, are fitted in engine-room for feeding the boilers, pumping bilges, and for fire, sanitary, and wash deck purposes; also for filling and emptying the water ballast tanks. Special provision is made for pumping out the bilges in every part of the vessel by the main and auxiliary engines.

The electric engine and dynamo is fitted in a recess in engine-room.

The engines are fitted with Weir's heater and distiller.

The propeller is 14 ft. diameter; 15 ft. 6 in. pitch; and 70 square ft. of surface, fitted with four moveable blades of Vicker's steel, sheathed with brass at tips.

There are two boilers, each 13 ft. diameter by 11 ft. long built of steel, with three Fox's corrugated furnaces, for a working pressure of 160 lbs. per square inch; the total heating surface is 3,400 square feet, and grate surface is 115 square feet.

There is also a donkey boiler 8 ft. diameter by 8 ft. 6 in. long, built of steel, fitted with feed donkey, &c., on the upper deck, for supplying steam at 100 lbs. pressure to the winches, electric light, and auxiliary engines.

The vessel was christened by Miss Edith Giles, daughter of Mr. Alfred Giles, M.P., chairman of the company.

## A NEW PROTECTED CRUISER.

THE keel plate of a new protected cruiser of the first-class, to be called the *Centaur*, was laid down at Portsmouth on 20th January. According to programme three vessels of the same class were to be commenced during the current financial year and completed in 1892, the others being the *Edgar*, building at Devonport, and the *Hawke*, under construction at Chatham. The type of cruisers is officially distinguished as improved *Merseys*, and it is satisfactory to know that the *Mersey*, *Severn*, and *Thames* were admitted to be excellent vessels by the Committee on the Naval Manœuvres, who took exception to all the other classes of ships composing the rival squadrons. They were acknowledged to be good sea boats and handy, to have steady gun platforms, and to be able to fight their guns longer than most ships. And though various improvements were suggested as to working details, it was stated that no important defects had been developed in them. In the new cruisers, however, various important improvements will be introduced. The *Mersey* measures 300 ft. long by 46 ft. broad, with a displacement of 4,050 tons, engines of 6,000 H.P. and a speed of 18 knots. In the *Centaur*, on the other hand, the length will be increased by no fewer than 60 ft., her dimensions being—length, 360 ft.; breadth 60 ft.; draught 23 ft. 9 in.; and

displacement 7,350 tons. Her engines will develop 12,000 H.P. under forced draught, and 7,500 under natural draught, giving her an estimated speed of 20 and 18 knots respectively, while the 850 tons of coal which she will carry in her bunkers will enable her to steam a radius of 10,000 knots at a 10 knot speed, and of 2,800 knots at a speed of 18 knots. The double bottom will be considerably more extended than in the *Mersey* class, while the protective deck, which will be carried from end to end, will have a maximum thickness of five inches of steel, and combined with certain novel devices for protecting the guns and their crews, will dispense with the necessity for defending the broadsides by thin vertical armour. Some exception was taken during the manœuvres to the armament of the *Mersey* class, the captain of the *Severn* considering that the 8 in. guns on the poop and forecastle should be removed and their places filled by guns of lighter natures, while Admiral Baird was of opinion that the whole of the cruiser class of vessels were too heavily armed. Admiral Hood, on the other hand, was decidedly opposed to reducing the weight of the bow and stern guns. The opinion of the late First Sea Lord appears to have prevailed, for the armament of the *Centaur*, exclusive of machine guns and torpedoes, will consist of two 9.2 in. guns, ten 6 in., and a dozen 6-pounder quick-firing guns.

## THE TORPEDO BOAT "CUSHING."

THERE is no doubt that the new sea-going torpedo boat No. 1, bearing the name of *Cushing*, will be the finest of the marvellous productions of the blind boatbuilder, Herreshoff, from whose yard she will soon be launched. Commander G. A. Converse, U.S.N., has charge of her construction. She is 138 ft. long, 15 ft. wide, 10 ft. deep, and draws 4 ft. 4 in. Her displacement is about 100 tons. The *Cushing* is required by contract to make 22 knots an hour. For every fourth of a mile above 23 knots per hour, Uncle Sam offers to pay the blind boatbuilder a bonus of 1,500 dols., and for every quarter of a knot above 24 knots per hour, he will pay Mr. Herreshoff a bonus of 2,000 dols.

The *Cushing* will be an extraordinary powerful craft. That ocean greyhound, the steamer *City of Paris*, has a displacement of 10,000 tons and 16,000-horse power, a ratio of horse-power to displacement of 1.6 to 1. The *Cushing's* displacement will be just 103 tons, and her maximum horse-power 1,600, showing a ratio of 16 to 1. So that if her model is all right—it is that of a long, shoal water-flyer—she may be calculated upon to do some wonderful things. The hull of the *Cushing* is divided into eleven water-tight compartments. All the quarters are plainly but very comfortably furnished. She will carry 35 tons of coal, and will have a coal endurance at maximum speed of 3,000 knots. The hull is built throughout of steel plates, and there are over 125,000 rivets in it. By means of steam ejecting apparatus in each compartment and the donkey and other pumps, this little steel wonder should be able to blow out a volume of water equal to her own bulk in ten minutes, so that she can readily be kept afloat, even if badly injured. For 61 ft. of the amidship length the hull is practically double, the coal bunkers sheathing her sides to that extent.

Above the water-line the *Cushing* will show only two conning towers and two smokestacks. A whaleback runs from the forward conning tower to the bow. The whole deck is of steel, and curved so as to deflect shot.

In every respect, save in the condenser, the *Cushing* is a twin-boat. The two Thornycroft water-tube boilers were built by the Continental Ironworks of Brooklyn, N.Y., and are the first of the kind constructed in this country. They consist of two water legs and a round steam drum arranged somewhat in the shape of the letter A. Between these run the water tubes of the boiler, so bent as to present the greatest amount of heating surface. Each boiler has 34 ft. of grate surface, 1800 ft. of heating surface, and two miles of steel tubing. The fire-rooms are arranged on the closed stokehold principle. They will be closed nearly air-tight, and an efficient fan blower will force air down from an opening in the deck. The coal bunker protecting the engine will be drawn upon only after the others have been cleaned out.

In the *Cushing's* engine-room is the maximum of power in the minimum of space. The main engines are two sets of five-cylinder quadruple expansion engines of 800-horse power, and there will be a total of twenty-eight steam cylinders on board.

The high-pressure cylinders are 11½ in. in diameter; the first intermediate 16 in., second intermediate 22 in., and low pressure 22 in. The stroke is 15 in., and the cranks are set so as to give the least vibration. The two main shafts are 5½ in. in diameter, 61 ft. long, are of forged steel, and will carry twin propellers of manganese bronze 4 ft. 2 in. in diameter, with 8 ft. pitch. A reducing valve will allow the use of direct steam at starting. The engine will be almost noiseless, and can easily be reversed by one man. It has been tested to three times the tensile strain required. The engine-room will be manned at each watch by two engineers, two oilers, and two water tenders.

The conning towers are of ½-in. steel, with double sliding doors, arranged so that one, if injured in action, can be substituted for another. The towers are lighted by bull's-eyes, and their domed tops may be elevated by screws, so that 4 in. clear space about the horizon may be had. Both towers are fitted with steering apparatus, engine-room telegraph, and with voice-tubes connecting the two towers. The command will be in the forward tower until that is disabled, and will then be transferred to the after-tower, where every movement made from the first has been duplicated by mechanical appliances. The forward tower has a steam tiller that will throw the helm from hard-a-port to hard-a-starboard in three and a-half seconds, or before the vessel can travel her length at full speed. The rudder ropes are of wire.

The automobile torpedoes will be fired at a speed of 40 ft. per second, while the *Cushing* is travelling 38 ft. in the same time. They will be discharged by an explosive compound. The two bow torpedo-tubes are placed under the whaleback at an angle of 3 deg. with the horizon. They are 14 ft. long, and 14 in. in diameter. The *Cushing* will also carry other torpedo-tubes and rapid-fire guns mounted on deck. It is expected that the vessel will be ventilated when in action by connecting the compartments with the outer jacket of the smokejack. The deck lights are so arranged that they may be darkened when in action at night. The ship will be lighted by electricity. If the present winter be an open one, it is likely that the *Cushing* will be launched before March, and will be immediately subjected to her speed trials on Narragansett Bay.—*New York Sun*.

## THE TORPEDO GUNBOATS "GOSSAMER" AND "GLENER."

ON January 9th two new first-class torpedo gunboats were added to the Royal Navy by the launch of the *Gossamer* and *Gleaner* at Sheerness Dockyard. The *Gossamer* and *Gleaner*, which are sister ships, have been built side by side, and were begun on January 21st, 1889. They were designed by Mr. W. H. White, Assistant Controller and Director of Naval Construction, and have been built entirely of steel. They are 230 ft. in length between perpendiculars, 27 ft. in breadth, and draw 8 ft. of water forward and 8 ft. 6 in. aft. They have a displacement of 735 tons, and the weight of their hulls, when ready for sea, will be 320 tons. The vessels have been constructed upon similar lines to the *Seagull*, lately tested at Portsmouth, and on account of the experience gained at the trial of that vessel intercostals have been fitted in their bunkers during the past few days to strengthen the hulls. A new feature introduced in the construction of these vessels is the "lapped system" of outside plating, which, although not looking so finished as the flush system, adds strength to the hull. The ships are fitted with a topgallant forecastle, but have no poop. A highly-elevated conning tower is placed forward, upon which the electric light will be fitted. They are well provided with watertight compartments, and a bulkhead partition runs fore and aft, dividing the engine rooms, for the protection of the vessels in case of accident. The *Gossamer* and *Gleaner* are to be fitted with machinery of a powerful character for their size. Working under forced draught their engines are to develop 4,500 H.P., and to propel them at a rate of 21 knots, so that they will rank with the fleetest vessels in the Navy. The natural draught power of the engines is 2,500, with a speed of 18.75 knots. The engines are of the triple-expansion type, were designed by the engineering staff at the Admiralty, and made in the steam factory at Sheerness yard, under the superintendence of Fleet Engineer W. G. Littlejohns, late chief engineer of the establishment. Special interest will attach to the vessels from the

fact that their engines will be the first made at Sheerness Dockyard, the machinery of ships previously built at the yard having been supplied and fitted by contract. The engines for the *Gossamer* are ready for being fitted on board, but those of the *Gleaner* are not yet out of hand. The *Gossamer* and *Gleaner* are unarmoured, but protection will be afforded to their engine and boiler compartments by the coal bunkers, which are fitted on each side, while the boilers are also protected by coal bunkers passing over their tops. The armament of the vessels will be identical, and will consist of two of the new 4.7 inch quick-firing guns, mounted at the stem and stern respectively, and four 3-pounder quick-firing guns, mounted at the broadside. They will also carry five tubes for discharging Whitehead torpedoes, one being at the bow and two at each broadside. The vessels will be fitted with steam steering gear, electric light machinery, distilling apparatus, torpedo air service, and all other recent improvements. They are provided with storage accommodation for 100 tons of coal, which is sufficient to enable them to steam 2,500 knots at an economical speed of 10 knots. The vessels will have two masts, which will be lightly rigged. The *Gossamer* is expected to be ready for sea in about four months, but the *Gleaner* will not be out of hand till next autumn. The *Gossamer* is estimated to cost £59,585 and the *Gleaner* £59,591.

## MARINE ENGINE GOVERNORS.

By MR. J. D. CHURCHILL.

(Paper read before the Institute of Marine Engineers.)

THE writer does not propose to go into the mechanical question, but is more particularly desirous of bringing before your notice some facts connected with Marine Engine Governors which may not have presented themselves to your minds; also to meet objections sometimes raised to their detriment, feeling confident that if they were more thoroughly understood they would be much more highly appreciated, and the frivolous objections sometimes raised would be appraised at their real value.

Judging by the writer's experience, which is far from limited, Governors have rarely received the attention they deserve. They have a very considerable and direct bearing on, or connection with, the question of preventable damage and losses at sea, consequently they ought to receive special attention from those interested.

Where human life and enormous amounts of valuable property are at stake, it is the bounden duty of all concerned, whether owners or otherwise, to insist on every possible precaution being taken to minimise the risk; therefore, any appliance or arrangement which in any way tends to this desideratum demands careful and prompt consideration. Political economists tell us that every loss, whether of life or property, is a national loss, and is not confined to the individual.

It is not necessary for the writer to explain the mechanical details and action of his own Velometers and Governors, seeing that there are upwards of 2,200 of them in use, which may be accepted as ample proof of their efficiency.

The Compound Attachment is an arrangement actuated by the Governor, by which all the cylinders may be controlled. If perfect governing is required this should be fitted in all cases.

The writer's remarks refer solely to Governors operated or driven by the main engines, as he considers all others are but very poor apologies and not entitled to the name of "Governor," as they have only occasional control over the engines, not available in case of accident, whereas, a real Governor, properly fitted and worked, has continuous control over all the cylinders under all conditions and circumstances.

Governors are frequently fitted in positions most difficult, sometimes dangerous, to get at, giving the idea that they are not intended to be used, only viewed from a distance. Consequently they are not always kept in proper working condition, much less continuously at work, as they ought to be. This is not fair to the makers, and unfortunately, they are not in a position to insist on proper fitting and vocation of the machine.

A strong protest ought to be entered against Governors being considered as only rough weather attachments. They are that and very much more. A Governor is as much as

integral part of an engine as a safety valve is an integral part of a boiler, or an automatic brake is of a train. The law compels you to fit these to prevent accident. For precisely the same reason it ought to be compulsory to fit a Governor. A Governor is, pre-eminently, a safety appliance, and not as most people imagine, simply a machine to prevent racing. It is a safety appliance directly affecting, as it tends to prevent or minimise the effects of a breakdown, and possible loss of life and property at sea, and as such it ought to receive very special attention from those responsible for the lives of our sailors and passengers.

The machine ought to be so fitted as to be easily accessible from the starting platform, and so that whenever the engines are at work it shall be in operation. It ought not to be optional with, or even left to the discretion of, the engineer on watch to decide when it shall be put on, unless you can make it optional with him, or leave it to his discretion, when an accident shall happen. It is an automatic check in case of accident, and common sense and common humanity demand that it should be a permanent attachment and continuously at work.

A good Governor, if properly fitted so as to control, at any rate two out of the three cylinders, will prevent racing, but it is unreasonable to expect it properly to control a three or four cylinder engine when it only has hold of the H.P. cylinder, thus leaving two-thirds or three-fourths of the engine uncontrolled just at the most critical moment. If a Governor and Compound Attachment are properly fitted to an engine, no matter how many cylinders it may have, it will be held under perfect control with full steam on, and the ship may be driven, —so far as the engines are concerned, and without reference to those on deck—at full speed in the heaviest weather, and there will be no indication of racing.

It is in heavy weather when the engines are subjected to violent shocks and stresses, caused by excessive and sudden variation of load, that the damage commences, but owing to the engines being eased down, the beginning of an accident does not then appear. When the weather moderates the real danger of a breakdown arises, as full steam is then put on, stressing everything to its utmost, and then follows the collapse.

Perhaps it has never occurred to many to notice when breakdowns take place. By far the largest proportion occur in fine weather, and not in rough weather. It is in fine weather that the engines are most severely pressed. If the shaft breaks, the engines will fly away at an unknown speed, and before the engineer has time to think, much less to act, it is through the ship's side or bottom, or the stern is pretty well shaken off, in either case producing serious leaks, as in the case of the *s.s. Danmark*, where some 800 lives were in peril from this very cause. If a good Governor properly fitted is continuously at work the engines could not practically exceed their normal speed; thus the danger and damage would be reduced to a minimum in case of accident, as it would give the engineer in charge a chance to stop the engines before much damage could be done.

The injurious effects of racing are felt throughout the whole engine and its fittings, and the author cannot do better than quote the words of a well-known writer on this subject, Mr. T. G. Barron, who speaks from long practical experience at sea. He says: "When an engine attains suddenly a speed of double the number of revolutions per minute at which it is intended to run, and is as suddenly brought up to its normal rate, it may be said to be racing, although very much worse racing than this is common enough; and the whole strain of the sudden check to the engines, caused by the extra resistance offered by the water to the propeller as it dips, after being partially or wholly lifted out of the water, must necessarily be transmitted through the whole length of shafting and coupling bolts from the propeller shaft to the crank shaft. If the Governor is quick enough to check the racing before the propeller is again immersed, the twisting strain to the shafting will be avoided, or at least greatly reduced. There is also a severe straining to the pumps, pump rods, and links, caused by the racing, the pumps being unable to deliver the water quickly enough; and the bucket valves coming down heavily on the surface of the water put extra weight on the rods and other gear, as well as destroying the valves. The feed pumps being only partially filled with water, and the rams coming suddenly in contact with it give a shock to the barrels of the pumps, and also to the pump rods, &c., which is not the case when running at the normal speed. A continuance of this vibration loosens the bolts of the engine, and in fact it would be

difficult to say where the evil of racing ends, and it is only necessary for the shipowner to know a small portion of it in order to see the benefit of a thoroughly efficient Governor."

Only quite recently we have had reports of serious damage having been done by racing, to the pump valves, condenser doors, &c. In one case the condenser doors were cracked, and the main steam pipe caused to leak, necessitating the stoppage of the ship at sea for repairs, generally a very difficult and dangerous operation.

Amongst other very serious results of racing is the loosening and frequent fracture of the stern tube and bush, and damage to the hull caused by excessive vibration; also the great alarm it causes on board passenger steamships, a serious consideration, though it has neither a mechanical nor economical bearing.

There is also the prejudicial effect of vibration, such as that produced by racing, on the chronometers and compasses. This is confirmed by the leading makers of these instruments.

If an ungoverned engine gets away, which it may easily do to three or four times its normal speed, it will cause considerable agitation of the water in the boiler, materially facilitating, if not actually causing, priming, especially in boilers so inclined, thereby incurring the risk of serious damage in the steam pipes by water hammering, and breakages in the cylinders. The condenser is liable to become overheated, owing to the circulating pumps not working efficiently at racing speeds, causing partial or total loss of vacuum when the full power of the engines is required, danger of leakage, and breakdown of condenser through undue expansion and contraction. These difficulties can only be overcome either by throttling (wire-drawing) the steam, or else linking the engines up, in both of which cases there is a material loss of power and speed, which can almost entirely be avoided by the use of a proper Governor.

It is sometimes stated that even if triple engines do race, it is not as objectionable as with two crank engines. Such a remark can only apply to one's personal comfort, as acceleration of speed means a considerable increase of wear and tear.

All experience proves that under similar conditions a three-crank engine will get away more quickly, and run at a higher speed, than one with two cranks. Granted the three-crank may run more smoothly than a two-crank, and its racing, therefore, would not be so uncomfortably perceptible; but all other objections and risks remain, and if anything are increased.

While compound engines were in vogue, there was hardly an engineer but who insisted on having them fitted with reliable Governors; but since the introduction of the triple-compound engine, an idea seems to have got abroad that they do not require Governors—why or wherefore it is difficult to explain.

There is no doubt that the late low prices and keen competition have considerably militated against Governors; and the writer cannot but think it is a "Penny wise and pound foolish" policy to cut them out of the specification. A paltry saving of a few pounds as compared with the value of human life, and the jeopardising of such enormous interests, seems a parsimonious course.

(To be concluded in our next.)

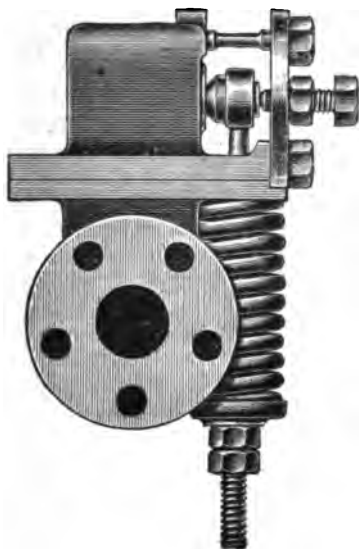
**MERCHANT SHIPPING (LIFE SAVING APPLIANCES) ACT.**—The Board of Trade have determined to postpone till the 30th day of June next the operation of the rules made under the provisions of the Merchant Shipping (Life Saving Appliances) Act, 1888, which were to have come into force on the 30th of March.

**PETROLEUM GAS ENGINE.**—A three-cylinder petroleum gas engine has been made by M. Lalbin, of Nantes, and fitted on board a launch, the three cylinders arranged at 120 deg. apart. It is said that a one-horse engine weighs only 132 lb. Ignition is effected by a battery of Leclanche cells. The *Genie Civil* describes the engine. The diameter of the cylinders of the five-horse engine is 130 mm., the stroke 135 mm., and the speed up to 400 revolutions.

**THE SUEZ CANAL.**—The traffic receipts of the Suez Canal on January 21st amounted to 140,000f., against 200,000f. on the corresponding day of last year.

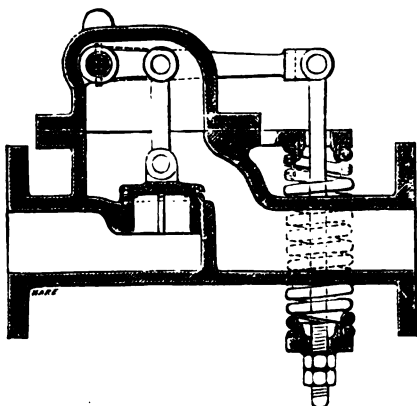
**REID'S PATENT STEAM REDUCING VALVE.**

**H**ITHERTO, from some reason or another, reducing valves have been more or less of failures and given no end of trouble. Our illustrations show a simple valve, patented by Messrs. Wm. Reid & Co., of 45, Fenchurch Street, London, which practically is a safety valve and almost impossible to get out of order. It is free from all so-called automatic and complicated arrangements, and seems to be simplicity itself. Prior



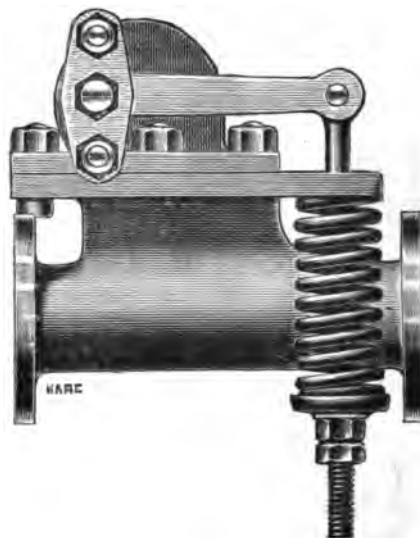
to now, as a rule, valves have generally been placed on the top of the boiler, or some other awkward place, so that in the event of anything going wrong, great difficulty is experienced in getting at them. We have always held that the proper place for a reducing valve was in the engine-room under the care of the engineer in charge, so that he could attend to it as in the case of an ordinary stop valve, and we are supported in this opinion by many chief engineers.

In the construction of this valve no packing, pistons or diaphragms are used, as is generally the case, the spindle being carried through the cover, and kept



steam tight by the cone. It does not accumulate steam; is easily regulated to suit any required pressure by altering the nut, and easily taken to pieces and fixed. It is compact, and takes up little space, and its inventors guarantee its simplicity and efficiency.

A 2-in. bore valve only occupies  $11\frac{1}{2}$  inches between the flanges, and costs only £10. Up to and exclusive of the 2-in. bore the valves are made of gun metal, and above 2-in. special cast iron is used with gun metal seat and spindle. These valves have been well



tried in triple-expansion engines connected with the main pipe, supplying steering gear, winches, windlass, &c., and Messrs. Reid & Co. will be pleased to supply samples on approval. Altogether, we think this valve a marked improvement on the old style, and its excellence only requires to be known to secure its wide adoption.

**SPECIAL TOOLS FOR MARINE ENGINEERING WORK.**

**M**ESSRS. HULSE & CO., of the Ordsal Works, Salford, have for some time past paid particular attention to the production of improved and special designs of tools suitable for marine engineering works, and we give illustrations of several of the new designs they have recently introduced. The whole of these tools are intended to meet the present requirements of

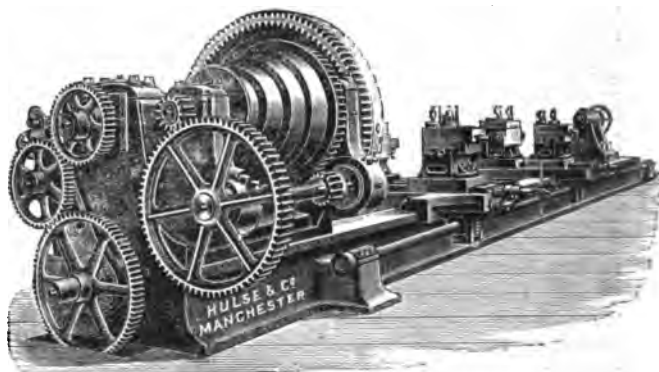


FIG. 1

marine engineers, and they possess special features which will, doubtless, be of interest to our readers. Already these tools are in use in some of the leading marine engineering works, not only of this country,

but abroad, and so largely has this branch of their business extended that the firm are now engaged in the erection of additional new shops in connection with their present works, which will be fitted with special plant for the manufacture of marine engineering tools.

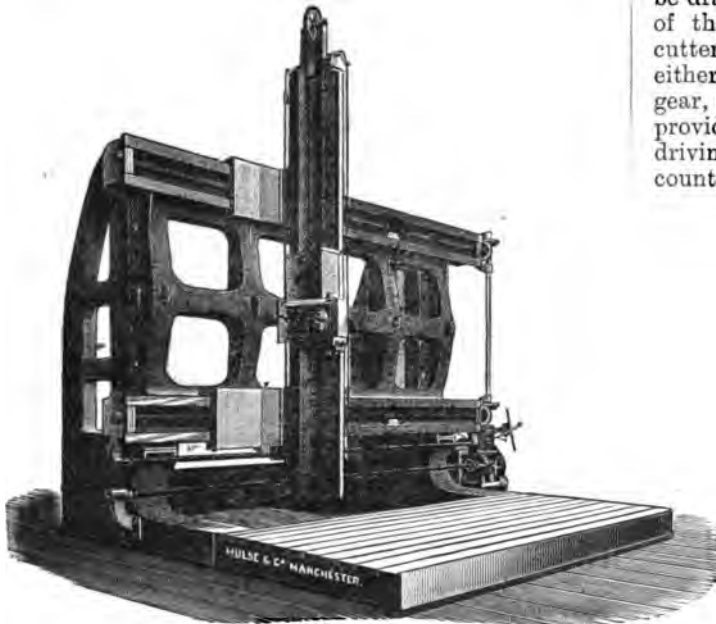


FIG. 2.

Illustration Fig. 1 represents a Patent Duplex Lathe, with four cutting tools suitable for turning the parallel and taper parts of propeller shafting, &c. It is constructed on their well-known principle, viz., with non-rotating twin guide screws and rotating nuts for traversing the sliding carriages along the bed, which system enables the carriages to be traversed in either direction quite independently one of the other, the mechanism for setting in motion, reversing and suspending each being carried by the carriage itself. The twin guide screws are placed one at the front and the other at the back of the lathe bed, in order to avoid cross-straining of the carriages (a defect inherent in most lathes with single screws), and consequently not only a greater production of work, but greater accuracy also is obtained.

Illustration Fig. 2 shows a combined Vertical and Horizontal Planing Machine, of which the firm have made a great number of various sizes, and several of these machines they have now in hand at their works, the size most in request being that which planes 16 ft. horizontally and 12 ft. vertically. The traverse motions are obtained by screws so arranged that when cutting vertically the horizontal screws impart the self-acting feed-motions and *vice versa*. In some of the machines referred to the firm's "broad traverse" feed motions have been applied, by means of which feeds graduating from zero up to as much as one inch broad at each stroke of the machine are applied with perfect regularity.

Vertical Cylinder Boring Machine, capable of cylinders up to 120 in. diameter, is shown in illustration Fig. 3. This machine consists of massive base-plate, surmounted by uprights,

and a cross-beam of box section. The self-acting boring bars are rotated by worm-gear and five speed cone pulleys, driven by a self-contained engine, so that the boring of a large cylinder may go on continuously till completed. To facilitate the removal of a cylinder when bored the boring bar may be drawn vertically through the cross-beam and out of the cylinder. The sliding sockets carrying the cutter heads are fed automatically along the bars in either direction by means of screws and differential gear, and in addition quick traverse motions are also provided. Sometimes the combined engine for driving is inconvenient, and in such cases the usual counter gear is furnished instead.

A Universal Horizontal Drilling, Boring, and Milling Machine is shown in illustration Fig. 4. This tool is made in several sizes and fitted when requisite with an apparatus for drilling seven holes at a time in condenser tube plates, and a second similar apparatus to afterwards tap them. In these machines the following self-actions are furnished, viz., variable self-acting feed motions for drilling and boring, and for milling, both vertically and horizontally, and quick power traverses for the ready adjustment of the spindle to any required position within the range of the machine.

Another tool of similar type to the above and somewhat similar in general appearance is shown in illustration Fig. 5. This is also a Horizontal, Drilling, Boring, Tapping, Studing and Milling Machine, the chief difference being that the spindle may be readily released from its propelling power—in this case a rack—in order that it may be free to follow the tap or stud. An accelerated motion is also provided for quickly with-

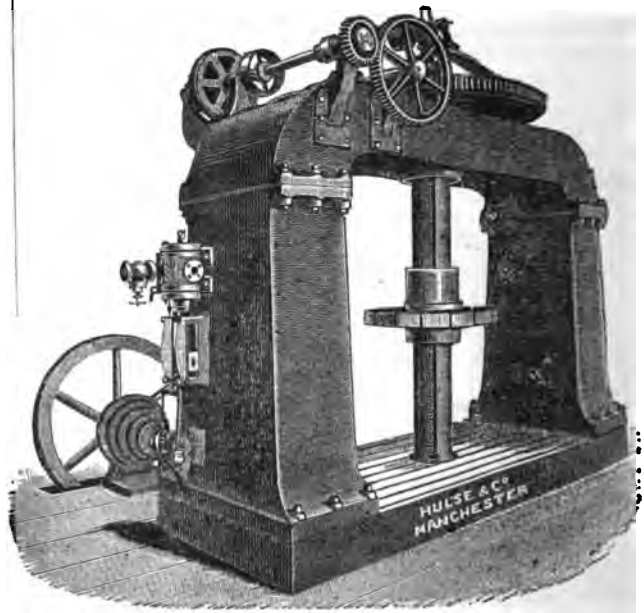


FIG. 3.

drawing the taps, and all the various motions are in close proximity with the workman when at his post.

**THE ESSON SEARCH LIGHT.**

**T**HIS invention has been protected in this country by Royal Letters Patent, and in foreign countries under International Convention, and among the many advantages claimed for it in comparison with the ordinary search lights now in use, we will give our readers a few of the most important.

The light can be ignited and thrown by one hand by simply squeezing the handle or end of the case, which is constructed specially for this purpose, whereas all existing lights require the use of both hands to manipulate them, which is very inconvenient in heavy weather or in cases where the other hand is required for a separate purpose. The light cannot be in any way damaged by coming into contact with water or moisture, and can be lit immediately in or out of the water, while it is impossible to ignite the composition by throwing or knocking it about, as it will only act when the handle is firmly squeezed all round. It can be used in the hand of the operator to light the vicinity close by, or may be thrown to any spot desired to be lighted up. When attached to belts or life-buoys they form a powerful floating agent, and can be instantly detached and ignited by persons falling or being washed overboard. For vessels in unknown waters or darkness the lights are arranged to be shot from a small quick-firing gun, and the surroundings can be surveyed for a mile or more in a few minutes. For naval purposes the search lights are fired from the ordinary machine-guns or by a special quick-firing gun, and can be shot to the locality of the hostile

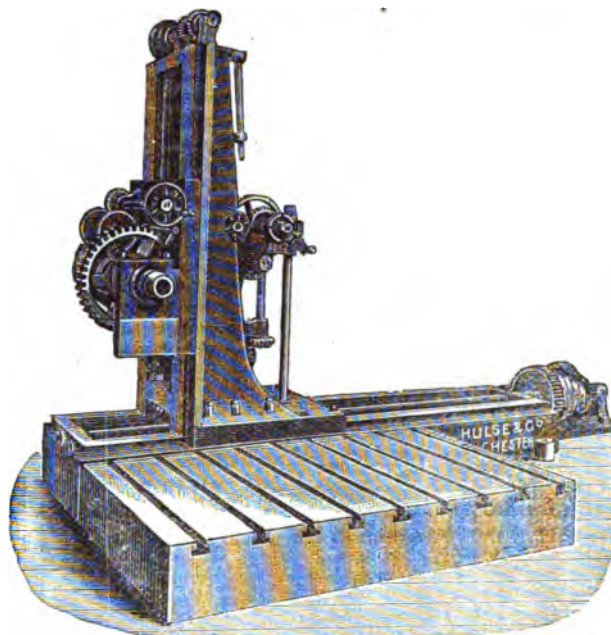


FIG. 4 (for letterpress see p. 460).

show where it came from and does not ignite until it has settled in the water. By this system the light can be fired to the other side of the object, which can then be far better seen than by a light shown on the near side.

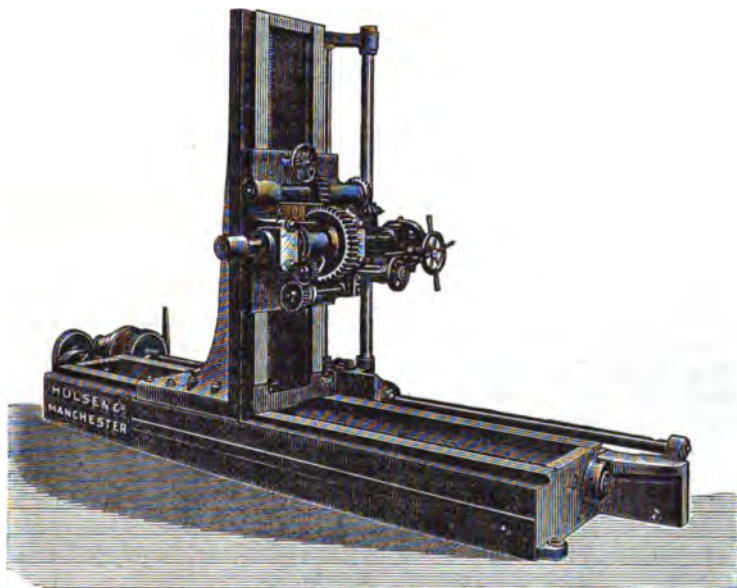


FIG. 5 (for letterpress see p. 460).

vessel or object to be exposed, without showing the whereabouts of the searchers, which is a serious defect in electric searching, as it not only finds its object, but at the same time exposes itself to the fire of the enemy. The Esson Search Light leaves no trace to

The price of these search lights is, we understand, little more than the ordinary hand signal lights at present in use, and they can be kept any length of time in store without being affected by atmospheric influence.

### CHAMBERS' BROTHERS IMPROVED PATENT PARTLY COLLAPSIBLE LIFEBOAT.

THE insufficiency of lifeboat accommodation which has again and again been shown to exist on board many of our large mail and passenger steamships, both in over-sea and channel service; and the impracticability of adding to that accommodation by boats of the ordinary type are considerations which have led Messrs. Chambers Brothers, Dumbarton, to design a type of lifeboat mainly intended to overcome these deficiencies and difficulties, although embodying many other features, which are notable from the life-saving point of view. Boats built to Messrs. Chambers' design have already been subjected to experiments, and several sets of them have been supplied to vessels of the first-class mail and passenger type, built on the Clyde. The distinguishing feature in this new type of lifeboat is its small depth when stowed aboard ship. It forms an amalgamation of the

with canvas upperworks erect, 2 ft. 8 in. The weight of each boat, if of pine, is only 16 cwt., or with mast, oars, &c., complete, 16½ cwt., equal to about one half the weight of a boat constructed in the ordinary fashion. Internally the space is subdivided into numerous self-contained compartments, fourteen of which are occupied by thoroughly air-tight metal tanks, affording the quality of buoyancy in a very high degree. There is accommodation for 40 passengers, and the thwarts, while serving the purpose of seats, are fitted underneath with tanks intended for the stowage of water, provisions, and distress signals. The structure of the boat is of great strength, and uniformly watertight. The outer shell consists of a double thickness of yellow pine, one thickness acting as the strap connecting the planks of the other thickness. A layer of prepared canvas is fitted between the two thicknesses. A longitudinal bulkhead of 1½ in. pine, made watertight, is fitted from end to end on each side, and similar athwartship bulkheads cut off the bow and stern into small compartments. A series of watertight partitions

STOWAGE PLAN  
SCALE ¼" = 1 FOOT.

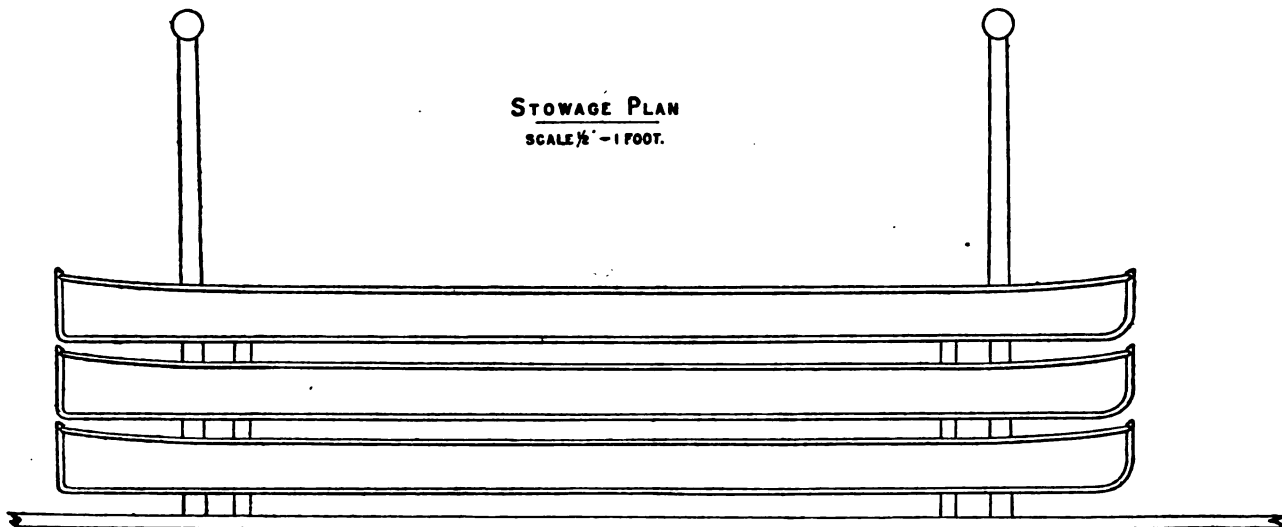
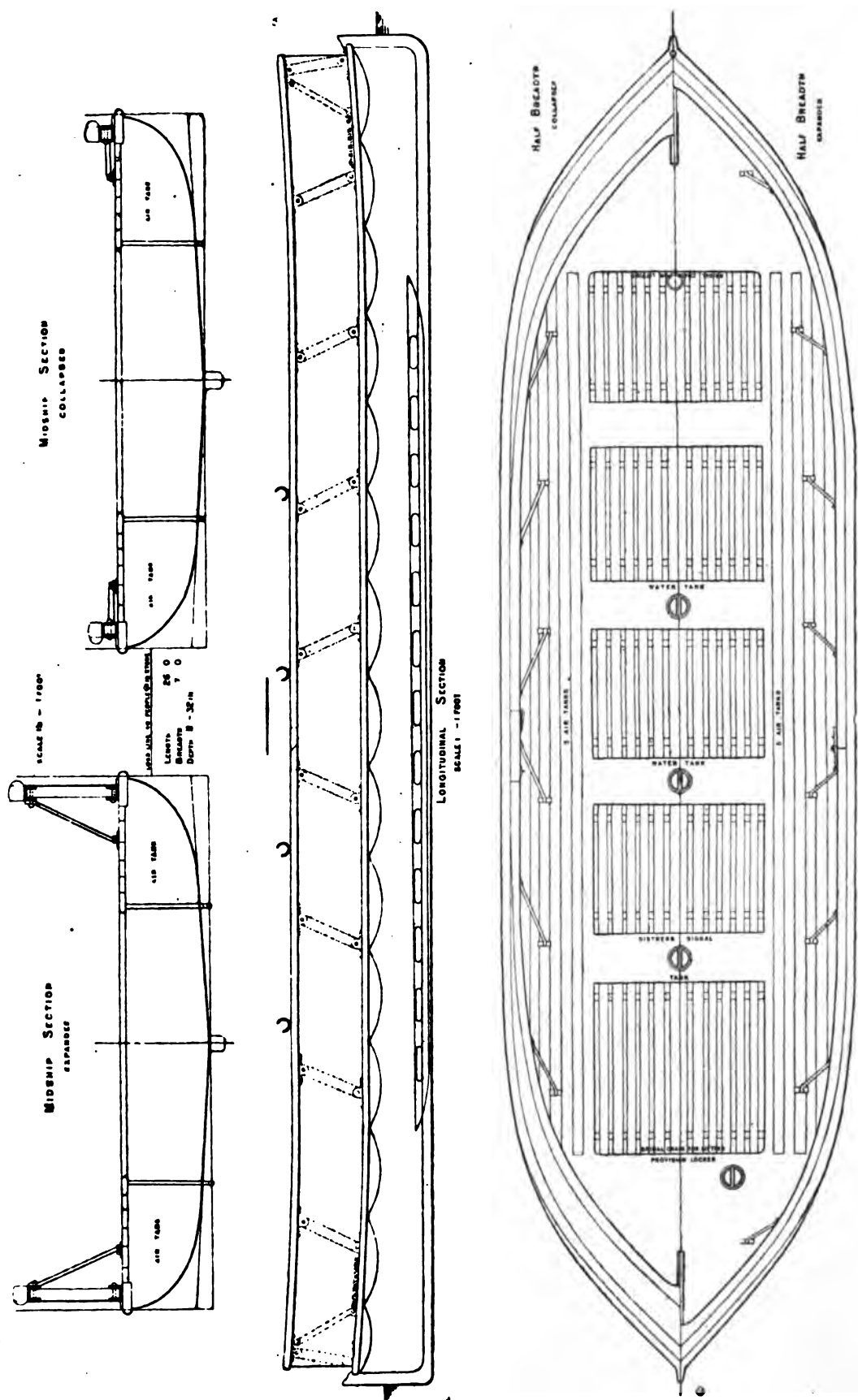


FIG. 1.

ordinary rigid style of wood construction, and the collapsible canvas method. The lower portion is, of course, the rigid part, and the upperworks are of strong waterproof canvas, extending from the gunwale of the rigid part to a rigid bulwark rail some 18 in. higher, which rail is supported by an inner framework of wood stanchions and malleable iron stays, the whole arranged so as to be collapsible and lie flat on top of the rigid part, when the boat is housed on board ship. By means of this amalgamation, the designers are enabled to have all the advantages, and, it is claimed, more than the efficiency of an ordinary lifeboat; while at the same time as many as four boats can be stowed in the space usually occupied by one of the ordinary type. The boats, as shown by Figs. 1 and 2, can be stowed in tiers, one above the other, the deck area occupied being the same as in the case of an ordinary boat, while the present means of launching and lowering by derrick can be altered nor increased. The boats designed by Messrs. Chambers are 26 ft. long, 14 in. deep to the fixed gunwale, but,

subdivide the sides of the vessel into ten compartments, each of which is completely occupied by air-tight tanks. It will thus be seen that ample provision is made in the way of reserve of buoyancy for any probable mishap, such as the shell being stove in, either in launching or by floating wreckage. So much so is this the case, the Messrs. Chambers claim that their lifeboat is absolutely unsinkable by any of the mishaps ordinarily attending lifeboat service at sea, a claim which is far in advance of what is conceded to the ordinary lifeboat built and equipped to Board of Trade requirements.

However this may be, the inventors have, with commendable thoroughness, so designed the lifeboat that in the event of its being capsized, either at launching or in the open sea, it can be easily righted. This is contributed to by the form of the hull and the disposition of the air-tight buoyant compartments, as well as by strong wood hand-grips, arranged along each side of the keel and by loops of cordage along the gunwale. In any contingency, however disastrous, the bottom of



CHAMBERS' BROTHERS IMPROVED PATENT PARTLY-COLLAPSIBLE LIFEBOAT.—See page 460.

the lifeboat is so formed as to constitute a raft, upon which a large number of passengers might cling for life with reasonable prospect of being saved.

Altogether, we are of opinion that this new lifeboat is quite as serviceable as the ordinary type accepted by the Board of Trade, and a distinct advance upon the efforts to provide for the full complement of passengers in large passenger vessels, which consist in the supply of wholly-collapsible canvas boats. The *raison d'être* of these craft is their convenience for stowage, but in Chambers' Brothers partly-collapsible boat this quality is sufficiently attained at the same time that all the

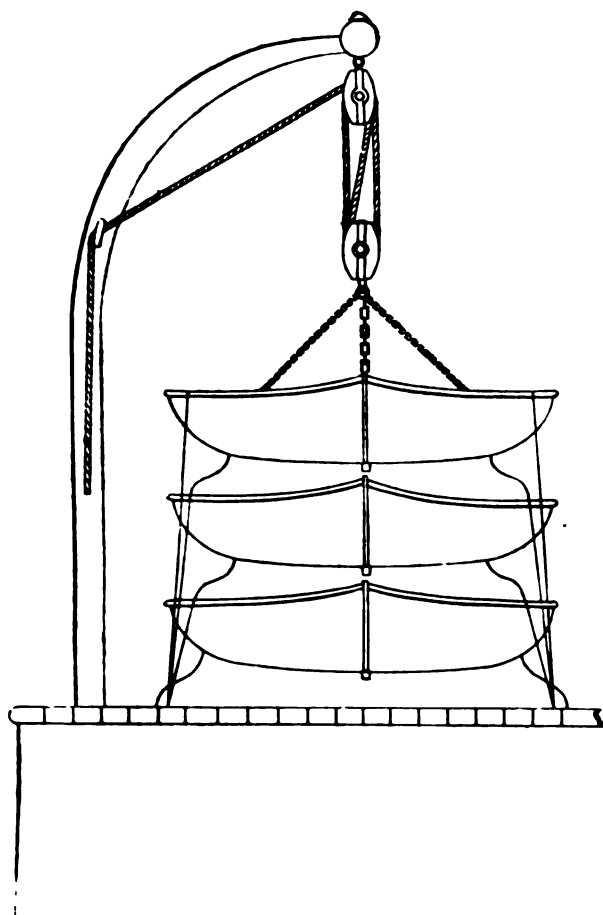


Fig. 2.

efficiency and strength of a lifeboat, as ordinarily constructed, are secured. Boats of this new type will doubtless speedily be adopted by those of our steamship companies who have most thorough regard for the security and lives of the passengers they carry, all the more so that, as we have reason to believe the Board of Trade have accorded their unqualified approval to the invention as being well fitted to meet the needs of the new life-saving appliances regulations, for all classes of vessels, coming into force on the 30th of June next. The agent for this new type of lifeboat is Mr. J. H. Lock, naval architect, 128, Hope Street.

## THE PROTECTION AND LUBRICATION OF PROPELLER SHAFTS.

THE lubrication of propeller-shaft bearings within the stern-tube has hitherto been chiefly effected by the leakage of a certain amount of water into the bearings, and its combination there with the oily surfaces of lignum-vitæ strips; or by forcing a mixture of oil and tallow between the plain unprotected bearing surfaces. In the one case the shaft, although partially protected by a sleeve of brass, has certain parts constantly exposed to the corrosive action of sea-water; while the other method, under usual conditions, does not afford a satisfactory means of lubrication; as the water washes away the unguent from the parts where it is most required, and the resultant corrosion and wear of shaft and bearings are most excessive.

To overcome these imperfections, and to reduce first cost, an important firm of engineers in Gothenburg, Sweden, for whom Messrs. C. Carlson & Co., 21, Hope Street, Glasgow, are agents-general in this country, are introducing what is termed "Cedervall's Patent Protective Lubricating Box." The principal objects of this invention are to absolutely prevent the access of any external water to the stern-tube whatever, and to provide a reservoir of oil capable of supplying a steady and continuous lubrication to the whole bearing surface. The invention consists, essentially, of an annular box of brass or gun metal, marked F in Fig. 1, containing an inner packing ring H, which is pressed outwards by a series of small spiral springs, G G. The box fits over the shaft, and is fixed to the front plane of the propeller boss by means of screws; and the inner movable ring presses against the prepared face of the stern-tube. The springs, while of ample strength, are of such elasticity that, irrespective of any play which the shaft may have in revolving or reversing, the ring maintains a water-tight joint with the end of the tube. As the ring is faced with anti-friction metal, and well lubricated by oil from the inside, it revolves with the minimum amount of friction.

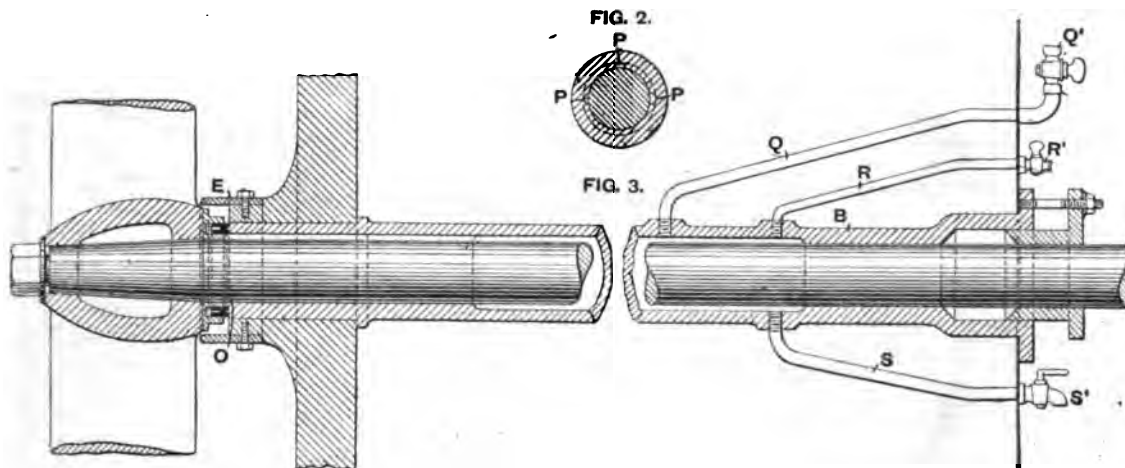
The method of applying the protective lubricating box, and the arrangement for supplying the lubricant, are shown in Figs. 1 to 3. Three grooves are cut in the aft bearing of the stern-tube, in the positions shown at P in Fig. 2. The top one is for the escape of air, and the other two are for leading the oil to the reservoir O inside the movable ring of the protective box. From the oil-chamber B three pipes, Q R and S, are carried through the aft bulkhead, or to any convenient place, and fitted with cocks. The oil is charged through the cock Q', and when all the spaces are filled the oil shows at the cock R'.

From the foregoing description it will be obvious that the protective lubricating box has several highly important advantages. Its adoption does away with the necessity for expensive liners and bearing metals—the plain cast-iron stern-tube being all that is required—and as a consequence of the efficient and uniform lubrication, coupled with the exclusion of all dirt and gritty substance from the bearings, the wear and tear on the propeller-shaft is reduced to a minimum. Experience with vessels already fitted with the patent lubricating box amply proves that, after a period of

more than two years' constant working, the shafts on examination exhibit bearing surfaces quite as good as any smoothly-working bearing connected with the engine proper.

The safeguard which this immunity from corrosion and absolute wear affords against breakdowns of the shafting, must be obvious to, and appreciated by, all having experience with the present expensive and not very efficient mode of fitting and lubricating propellers shaft bearings. Although heating of the

**REFRIGERATED BARGES.**—To prevent the ill effects of partial thaw on frozen meat when it is being unloaded from the cold chambers of importing steamers, the London and Tilbury Lighterage Company are employing refrigerated barges, each of which is provided with a semi-cylindrical cold-air chamber at a temperature below 20 degrees Fahr. The cooling apparatus is on an independent barge, and consists of the ammonia refrigerator of the Pulsometer Engineering Company, of Nine Elms Iron Works, London. Cold brine is the medium used to keep the chambers cool, and is found to serve the purpose very well. The air in the barges is clear and free from "hoar," which deposits on the brine pipes.

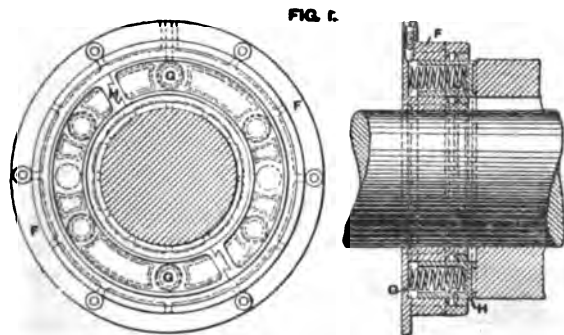


stern-tube bearings is most unlikely to happen with the arrangement shown; should it occur, the oil may be discharged at the cock S', and water forced through the bearings by means of a hose attached to the cock Q'. To obviate the possibility of the box being fouled by ropes, ice, or other floating bodies, a strong hoop E, made in halves, is fitted over the box, as shown in Fig. 3. Over 50 steamers in the Swedish and Danish merchant service have been fitted with this invention—some of them for over three years—with the most satisfactory results. One of these, it

**QUICK SAILING.**—The ship *Ulidia*, 2,200 tons net register, built by Messrs. Richardson, Duck & Co., Stockton-on-Tees, which left Middlesbro' dock on October 28th, loaded with 3,700 tons of railway iron for Monte Video, arrived out on December 22nd, after a remarkably fast passage of forty-seven days from the Downs, the average passage being sixty days.

**SCREW TUG "RACER."**—The powerful screw tug *Racer*, lately owned by the Queenstown Screw Tug and Shipping Co., Limited, has been purchased by Messrs. Kinghorn Bros., Tower Buildings, Water Street, Liverpool, and Glasgow, on behalf of Australian clients. The vessel sailed from the Thames on Monday last, after having her outfit completed, and on arrival at Australia will be engaged in towing in Hobson's Bay.

**STEAM NAVIGATION ON THE NILE.**—A new Egyptian association has been formed, styled the "Thewfikich" Company, who are the owners of a number of steamers, which have been specially fitted for a regular service of passengers desiring to ascend the river from Cairo to the first cataract, visiting the antiquities on the banks. The formation of this company has been sanctioned by a decree of the Khedive. The commencement of its operations has just been inaugurated by a personal visit of the Khedive for an inspection of the vessels and a reception on board the steamer *El Khedevie*. At the entrance to the docks of the company a triumphal arch was erected, the workshops and docks were gaily ornamented by flags and trophies, and the line of approach was covered with rich carpets; a large crowd was assembled, and the Khedive was received with loud demonstrations of loyalty. The president of the company (Rostovitz Bey) and several of the directors received his Highness on board, and the inspection which took place was of a minute character, the Khedive even descending into the engine-room. The saloon, ladies' boudoir, smoking-room, and all parts of the steamer are illuminated by 80 electric lights of a total power of 2,500 candles, and the decorations of the apartments are of the most elegant and luxurious character. Messrs. H. Gaze & Son are appointed the agents in Europe, Egypt, and America, for the passenger services of the company, and have opened new offices in Alexandria, Cairo, and other parts of the East.



may be mentioned, is the s.s. *Heckla*, of the Thingvalla Line of steamers, carrying passengers between Copenhagen and the United States—a vessel of about 1,800 I.H.P., with a screw shaft 16½ in. diameter. In this country the invention has received the official sanction of Lloyd's Register and the Bureau Veritas, and doubtless its adoption in British ships will be attended with results no less gratifying than in the case of foreign vessels already fitted with it.

**PETROLEUM LAUNCH.****LENOIR SYSTEM.**

**A**MONGST the craft afloat on the River Seine abreast the Quai d'Orsai, during the Paris Exhibition, was a completely equipped launch, exhibited by Messrs. Rouart, Frères et Cie, 137, Boulevard Voltaire, Paris, of which we give illustrations, Fig. 1 representing a general view of the craft, and Fig. 2 a transverse section, showing the motor, carburetter, condenser, tank, &c.

FIG. 1.

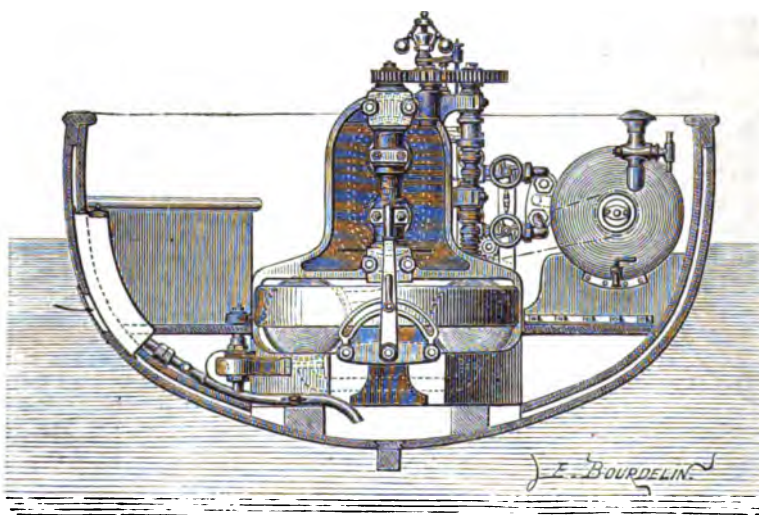


The launch is of the following dimensions :—Length, 23 ft. ; breadth, extreme, 5 ft. 5 in. ; draught of water, fully loaded, is nearly 2 ft.

The engine is rated at 3 H.P., and is constructed on the Lenoir system, which is adopted by Messrs. Rouart, Frères et Cie, both for gas and petroleum engines. In the building devoted to the Petroleum Panorama,

worked together, or, if less power be required, one cylinder can be worked alone. The speed of the engine, nominally 160 to 180 revolutions per minute, is dependent upon the extent to which the feed-valves for the oil are open, a hand-lever placed abaft the motor, and shown at centre line of Fig. 2, controlling the starting, stopping and reversing. The consump-

FIG. 2.

**LENOIR SYSTEM.**

a 2 H.P. Lenoir petroleum engine was also to be seen at use at night for compressing air to supply the incandescent light at the side of the building in the Quai d'Orsai. To Lenoir is due the honour of having constructed the first commercially successful gas-engine,

tion of fuel is stated to be about 1,200 grammes of gasoline, or of petroleum spirit at 0.650 density for 8 I.H.P. ; or 400 grammes, about 0.9 lbs. per I H.P. per hour.

As has already been indicated, this launch-engine is of the explosive type, an electric spark being used for ignition, so that no direct comparison with the other petroleum or vapour-launches is practicable. For fuller particulars, owing to pressure on our space, we must refer our readers to the manufacturers, Messrs. Rouart, Frères et Cie., 137, Boulevard Voltaire, Paris.

### THE MEANOMETER.

SO much attention is now being given to the interpretation of indicator diagrams, as tests of the working of steam-engines, that we here put before our readers a description of a mechanical appliance for measuring

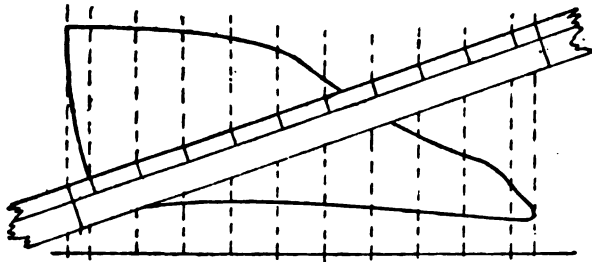
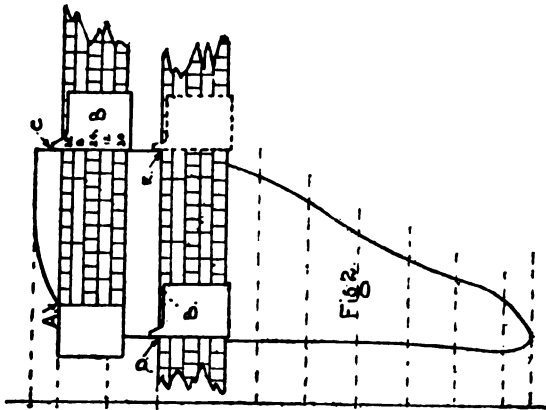


Fig. 1.



the mean pressure of indicator diagrams, called the meanometer, and introduced by Messrs. Barron & Harding, of 9, Alderson Street, West Hartlepool. The meanometer consists of a plain boxwood rule 13 ins. in length, provided with a brass index sliding upon it. The large rules have 12 sets of divisions, or scales, inscribed or printed upon the face and edges, corresponding to springs from 8 to 64 lbs. per inch of deflection, that is to say, if the spring used for the diagram was 64 lbs. per inch, the mean pressure is found on the rule opposite 64 on the index, the divisions being arranged so that the mean pressure is read off at sight without any calculation or mental effort. The back of the rules are marked with ordinary scales corresponding to those on the face, also there are scales for plotting off the ordinates which will

facilitate the operation considerably, as shown in Fig. 1, and needs no further explanation.

The method of using the instrument is as follows:— Having set off ten ordinates on the diagram in the usual manner, or by the aid of the scales just described, place the end of the meanometer scales at the exhaust line of the first ordinate, as at A, Fig. 2; then slide the index B to the steam line C, the index B being prevented from slipping by means of a small spring, the instrument is moved to the next ordinate so that the position of the index just obtained coincides with the exhaust line D, the index being then moved to the steam line E as in the previous case, the operation being repeated until all the ordinates have been measured; the mean pressure is then read off the meanometer opposite the required number on the index as already explained. Care must be taken that the rule does not move while each ordinate is being measured.

This is an appliance easy to understand and easily used when once it becomes familiar to the user, and should be useful in the hands of practical men to save arithmetical working, and to prevent the chances of arithmetical errors.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from November 25th to December 21st, 1889:—

- Bray, Wm. T., staff engineer to the *Calypso*, to date December 10th.
- Bryant, Chas. W., assistant engineer to the *Camperdown*, to date December 19th.
- Carnt, Edward C., engineer to the *Indus*, additional, to date December 3rd.
- Cooke, Geo. H., chief engineer to the *Cyclops*, to date December 7th.
- Coomber, Thos. G., chief engineer to the *Belleisle*, to date December 7th.
- Davis, Henry F., probationary assistant engineer to the *Impérieuse*, additional.
- David, Francis W., assistant engineer to the *Swallow*, to date November 29th.
- Donohue, Robert W., engineer to the *Pembroke*, additional, to date November 14th.
- Evans, Henry A., engineer to the *Swallow*, to date November 29th.
- Fawcett, John, engineer to the *Vivid*, to date January 1st.
- Frost, James J., chief engineer to the *Espoir*, to date November 10th (re-appointed on promotion).
- Gardiner, John, chief engineer to the *Alacrity*, to date November 30th.
- Green, Donald P., assistant engineer to the *Camperdown*, to date December 19th.
- Gilbert, Wm., fleet engineer to the *Alexander*, to date December 7th.
- Hayes, John E., assistant engineer to the *Hero*, to date December 7th.
- Hender, Wm. J., engineer to the *Cordelia*, to date November 30th.
- Hole, John W. I., chief engineer to the *Whiting*, to date November 25th (re-appointed on promotion).
- Humphreys, Henry, engineer to the *Warspite*, to date December 18th.
- Johnson, Henry G., staff engineer to the *Camperdown*, to date December 19th.
- Manning, Henry L., engineer to the *Camperdown*, to date December 19th.
- Martell, Percy D., assistant engineer to the *Cordelia*, to date November 30th.
- Moffett, Edward G. P., engineer to the *Sift*, to date December 7th.

Monkhouse, Warwick, engineer to the *Victoria*, to date December 7th.  
 Moysey, John, staff engineer to the *Iris*, to date November 30th.  
 Pattison, Robert, staff engineer to the *Cambrian*, to date December 11th.  
 Pill, Joseph H., engineer to the *Sans Pareil*, to date November 30th.  
 Rampling, Henry J., acting chief engineer to the *Grasshopper*, to date November 30th.  
 Raper, Robert St. J., engineer to the *Mercury*, to date December 13th.  
 Rees, J. D., engineer to the *Anson*, to date November 29th.  
 Ryder, John F., chief engineer to the *Cordelia*, to date November 30th.  
 Salmon, Charles, staff engineer to the *Alberta*, to date November 30th.  
 Sercombe, Francis J., assistant engineer to the *Camperdown*, to date December 19th.  
 Stephen, Lindsay J., assistant engineer to the *Camperdown*, to date December 19th.  
 Stevens, Charles, probationary assistant engineer to the *Volage*, to date November 29th.  
 Stewart, Wm. H. W., assistant engineer to the *Black Prince*, to date January 1st.  
 Toman, Richard W., engineer to the *Alacrity*, to date November 30th.  
 Travis, — assistant engineer to the *Serapis*, to date December 13th.  
 Tricker, Elijah, staff engineer to the *Galatea*, to date November 30th.  
 Underhill, Charles, engineer to the *Caroline*, to date November 30th.  
 Warren, Jas. J., staff engineer to the *Black Prince*, to date January 1st.  
 Weeks, Edward J., assistant engineer to the *Trafalgar*, to date December 19th.  
 Westbrook, Walter S., probationary assistant engineer to the *Camperdown*, to date Dec. 19th.  
 Whitmarsh, Alfred, probationary assistant engineer to the *Phaeton*, to date December 19th.  
 Williams, Stephen B., fleet engineer to the *Calypso*, to date November 29th.  
 Wright, W., assistant engineer to the *Warspite*, to date December 13th.

The following appointments have been made at the Admiralty from December 23rd, 1889, to January 24th, 1890:—

Backler, Leonard, engineer to the *Northampton*, to date January 17th.  
 Barnes, Benjamin J., chief engineer to the *Mohawk*, to date January 10th.  
 Bell, Edwin, engineer to the *Wye*, to date January 11th.  
 Beal, William Elvy, staff engineer to the *Sultan*, to date January 13th.  
 Blake, Albert V., engineer to Bermuda Yard, to date January 3rd.  
 Bromley, William (b), engineer to the *Goldfinch*, to date February 5th.  
 Chillcott, William W., fleet engineer to the *Wildfire*, additional for Sheerness Dockyard, to date, January 6th.  
 Eyre, Charles V., assistant engineer to the *Penguin*, to date January 14th.  
 Gedge, Henry A., assistant engineer to the *Warspite*, to date January 1st.  
 Gyles, David J., staff engineer to the *Excellent*, additional, to date January 4th.  
 Haddy, George A., chief engineer to the *Vulcan*, to date January 6th.  
 Haggerty, George A., engineer to the *Victoria*, to date January 17th.  
 Hall, John, has been appointed to succeed Mr. Hulford at Sheerness.  
 Hall, John (a), fleet engineer to the *Pembroke*, additional, to date January 1st.  
 Harris, Richard, chief engineer to the *Persian*, to date January

ert K., engineer to the *Mercury*, to date January

ick H., assistant engineer to the *Undaunted*, to  
 7 1st.

Hore, Frederick, engineer to the *Vernon*, additional, to date December 21st.  
 Hulford Charles, F., R.N., staff engineer of the Medway Steam Reserve, Sheerness, has been appointed chief engineer to the Royal Dockyard at the Cape of Good Hope.  
 Hulford, Charles F., staff engineer to the *Penelope*, to date January 1st.  
 Hunter, Robert A., assistant engineer to the *Pelorus*, to date January 17th.  
 Jackson, Thomas P., assistant engineer to the *Undaunted*, to date January 1st.  
 James, Charles R., engineer to the *Asia*, additional, to date January 3rd.  
 Jolliffe, Henry, staff engineer to the *Asia*, additional, to date January 6th.  
 Leigh, John, fleet engineer to Chatham Reserve, to date January 1st.  
 Little, Edwin, chief engineer to the *Excellent*, additional, to date January 1st.  
 Littlejohns, W. G., fleet engineer to the *Pembroke*, additional for Chatham Dockyard, to date January 6th.  
 Morris, Thomas A., chief engineer to the *Excellent*, additional, to date January 4th.  
 New, Thomas, chief engineer to the *Phaeton*, to date January 10th.  
 Paul, Oliver R., assistant engineer to the *Neptune*, to date January 1st.  
 Robins, John J., chief engineer to the *Serpent*, to date January 11th.  
 Rodet, Ernest W., assistant engineer to the *Warspite*, to date January 1st.  
 Roye, James A., assistant engineer to the *Phenix*, to date January 1st.  
 Sennett, Marrack, assistant engineer to the *Pandora*, to date January 17th.  
 Steward, Cornelius H., engineer to the *Thrush*, to date January 3rd.  
 Stewart, William F., engineer to the *Vernon*, additional to date January 3rd.  
 Swinney, Edward, engineer to the *Triumph*, to date February 4th.  
 Taylor, Harry, chief engineer to the *Pylades*, re-appointed on promotion, to date January 2nd.  
 Teach, Richard J., staff engineer to the *Indus*, additional, for Devonport Dockyard, to date January 6th.  
 Walton, John H., chief engineer to the *Egeria*, to date January 12th.  
 Watch John S., chief engineer to the *Excellent*, additional, to date January 4th.  
 Wilson, Alexander, fleet engineer to the *Triumph*.  
 Wood, Alfred, chief inspector of machinery to the *President*, additional, for service at the Admiralty, to date January 6th.

## HOAR & BROWN'S HARDWOOD MARKET REPORT.

TEAK—	TIMBER.	PLANKS.	BLOCKS.	TOTAL.
	Loads.	Loads.	Loads.	Loads.
Stock, 1st January, 1889 ..	4,961	1,428	25	6,414
Landings for the year ..	15,830	3,124	127	19,081
	20,791	4,552	152	25,495
Deliveries for the year ..	12,974	2,773	101	15,848
Stock 31st December, 1889 ..	7,817	1,779	51	9,647

The stock at the early part of the year being unusually small, and the demand for some months keeping pace with the supplies, caused prices to advance steadily, reaching the highest figures about July and August. Since then the deliveries have not been quite so large, and prices have been weakened by the persistent efforts that have been made to force upon the market inferior shipments of wood imported by steamers.

In addition to the figures shown above there are some 3,000 loads not yet taken into account, but this, being mostly wood of the quality just described, will not affect the price of first-class timber, the quantity of which in this market is by no means large.

The deliveries for the year are represented by the satisfactory total of 15,848 loads.

Although the Admiralty have placed their orders for the various types of war-ships required for the Navy, very few of the contractors have covered their engagements, so there can be little doubt that the demand for the coming season will quite equal that of last year, which was of a very satisfactory character.

The 4,000 loads for the ordinary Admiralty requirements, for which orders have been placed, will have to come out of next season's shipments, and, in addition, it is anticipated that there will shortly be placed upon the market an inquiry for a very much larger quantity.

The tonnage afloat is 32,678, and to load 24,119, against 19,466 tons afloat, and 25,360 tons to load, at the commencement of 1889, a large number of the cargoes afloat being already sold. The imports during the past year have been the largest on record.

The position may be regarded all round with satisfaction, the only disquieting feature being the price which the large quantity of inferior timber now here will realise.

There is every reason to believe the great activity which has existed during the past year in both the Shipbuilding and Rolling Stock industries will continue for the next twelve months.

**MAHOGANY.**—The market has been very firm throughout the year, with a steady increase in values. The stock from Honduras about July was one of the smallest ever known, and this had the effect of seriously decreasing the volume of business.

Prices at the present moment are higher than at any time during 1889, and it is doubtful whether the minimum can be maintained at the present figure, whilst it is not improbable that the prices of large wood will be advanced.

The Imports for the year were	9,326,035 feet.
Deliveries .. ..	8,787,437 "
Stock, 31st December ..	2,591,689 "

The stock being slightly in excess of that at the same date in 1888.

**CRAB.**—The business all through the year has been of a restricted character, in consequence of short supplies during the early part of the season. Most of the large consumers were well provided with stock bought at the low prices which ruled during 1888. Values advanced as the stocks were reduced, but the attempts of importers to force prices up to an abnormal figure have not met with success.

Recent importations have largely increased the stocks, and as holders show very little disposition to meet consumers' ideas of prices, the bulk of the wood still remains unsold.

The Imports have been	1,243,539 feet.
Deliveries .. ..	1,003,428 "
Stocks, 31st Dec.	1,126,506 "

The stock being considerably more than at the same period of last year.

**WALNUT LOGS.**—During the principal portion of the year the trade has been depressed, in consequence of the overflow of inferior timber, and the scarcity of prime shipments, and until lately when the stocks decreased, there has been little satisfactory business done among holders of large stocks. The appearance of the future is somewhat encouraging, and better prices are expected.

Imported out planks and boards have taken a prominent position in the market, and to some extent superseded the log trade.

Imports ..	3,628 Logs	..	79,727 Planks
Deliveries ..	6,027 "	..	64,273 "
Stock, 31st Dec.	562 "	..	35,173 "

**SATIN WALNUT.**—In consequence of the importations being somewhat restricted, prices show a slight advance over those of last year, and sales without reserve have become a thing of the past.

Most of the imports have passed through the hands of one firm, and the demand is limited.

Imports ..	358 Logs	..	3,618 Planks.
Deliveries ..	481 "	..	5,390 "
Stock, 31st December	39 "	..	1,936 "

**AMERICAN OAK.**—A large business has been done, both in boards and planks, a noticeable feature being the large sales of quartered oak, which has been eagerly bought up on account of the low prices ruling. The business in this class of wood has steadily increased, and is likely to continue to do so, provided sales can be made at present values, to compete favourably with continental imports.

**SATINWOOD.**—The importations have been small. Figury parcels are required and would command good prices. Small plain wood does not appear to be in request.

Landings for the year	...	...	377 Logs.
Deliveries ..	...	...	395 "
Stock, 31st December	...	...	236 "

**SEQUOIA.**—Although a slow trade has been carried on, prices have continued fairly remunerative, whilst the market has been moderately supplied; but the outlook is less encouraging, for the reason that several shipments have been ordered to the United Kingdom.

**GREENHEART.**—So little has been done that the trade may almost be said to have left London. Prices are now too high to encourage merchants to purchase floating stocks.

Landings for the year	...	...	292 Loads.
Deliveries...	...	...	497 "
Stock, 31st December	...	...	91 "

**CANADIAN WOODS.**—The business done has been of a very satisfactory character, the imports being on a scale which has just met the demand, so that prices are well maintained.

The stock at present both of Elm and Pine is rather small, considering the time which must elapse before fresh imports can arrive.

The generally improved character of the Hardwood market has shown itself strongly throughout the year, and points to continued prosperity for the year 1890.

## ANGIER BROTHERS' STEAM FREIGHT REPORT, January 18th, 1890.

**FREIGHTS** since our last report have shown a firmer tone, and rates have advanced. In China waters little alteration has taken place, but Saigon gives signs of awakening, there being a promise of fair shipments of ice thence to Europe, as well as Coastwise. Bangkok is also enquiring for tonnage. Burmah rice freights are firm, having advanced about 5s. per ton. Chittagong, Calcutta, Madras Coast, Bombay and Karachi are each bidding for steamers, and at decidedly better rates. The supply of February steamers is very limited, and their value increases. Black Sea took a fair number of boats at advanced figures for prompt loading. Spring prices are unaltered; not much doing. Mediterranean ore, grain and fruit rates are poor, with less demand. American business has been large, at the full advance for January and early February loading, but the demand has fallen off for later dates, and rates are down 3d. to 6d. per quarter for these. A large fleet of steamers has been chartered for grain, general cargoes, and cotton, besides a few oil boats. Brazil and River Plate business is very quiet out-and-home, and rates have fallen considerably. In time charters very little is doing. Outward coal rates are low all round, and terms ruinously long. Berth rates are similarly affected. Coal prices continue very high, and great difficulty is experienced in obtaining coals for bunkers or cargo. In ship building activity prevails, and orders are booked from week to week, but in small numbers, as prices keep beyond the ideas of prudent owners, and considering the heavy increase made in the tonnage afloat during the past two years, the probable decrease of earning power, and present increase of working cost, there exists little encouragement to order new boats. The work secured by builders will keep them busy well into the third quarter of the year. Good second-hand boats are still enquired for, but at less money.

## INDUSTRIAL AND TRADE NOTES.

### THE CLYDE AND SCOTLAND.

**JANUARY** is, as a rule, a quiet month in all trades, forming, as it does, a natural breathing-time after the efforts of the past year, and the balancing of affairs for a fresh start in the coming one. This, and the prevalence of a holiday feeling during a considerable part of the month, accounts for the comparative quietness which has characterized the month's doings in the shipyards and engine shops of the Clyde. Very few launches have taken place, and there has been a like dearth in the number of contracts for fresh work.

Messrs. Caird & Co., Greenock, launched early in the month *Wistow Hall*, a steamer of 3,200 tons, built to the order of the Sun Shipping Co., of Liverpool. Messrs. Murdock & Murray, Port-Glasgow, launched about the same time the *Rosneath*, a steamer of 2,650 tons deadweight, built for Messrs. P. H. Dixon & Harrison, Glasgow.

Two important vessels were handed over complete during the month, one being H.M.S. gunboat *Sparrow*, of 6,805 tons displacement, built by Messrs. Scott, of Greenock, and the other being the *Fara*, of 5,000 tons, built by Messrs. Inglis, of Point-house, for the British India Association.

Messrs. Denny Bros., of Dumbarton, launched during the month the swift paddle steamer (they have for some months been engaged on for channel service between Larne and Stranraer, the shortest sea passage from Ireland to Scotland. The vessel, which is named the *Princess Victoria*, is designed to perform the journey, a distance of thirty-five knots, in two hours at most, but it is anticipated that both on the measured mile and in actual service the maximum capabilities of the vessel will prove greatly in excess of this performance.

The Union Co.'s steamer, referred to in last month's notes as having been ordered from Messrs. Denny, is 497 ft. long over all, 460 ft. between perpendiculars, 54½ ft. broad, and 37½ ft. deep. Her tonnage will be about 6,500, and she will have carrying capacity for 2,400 to 2,600 tons of coal, and 2,000 to 2,400 tons cargo, and accommodation for about 200 first-class passengers, 80 second-class, and 250 to 300 third-class. Her engine developing a horse-power of 11,500, will actuate twin-screws, and with this power it is estimated the vessel will attain a speed on the measured mile of 18½ knots. To maintain an average speed at sea of 17 knots about 8,500 H.P. will be sufficient, and with this speed the passage to the Cape should be accomplished in about fifteen days' time.

There has been no order of any consequence booked since the year came in, and it is pointed out that owners have no great inducement to place new vessels, for not only are freights low, but builders' prices continue to be forbiddingly high, and besides, owing to the way in which some sections of the workmen are losing time and snatching at every pretext for stopping work, no promise can be given of anything like reasonable delivery.

Messrs. Scott & Co., Greenock, contracted about the end of the year with the Wallacey Local Board for a paddle steamer for ferry traffic on the Mersey, to carry 300 passengers, and to steam at the rate of 12½ knots per hour. The price to be paid for the vessel is stated at £12,650.

Messrs. David Macgill & Co., of the Irvine Shipyard, contracted about the beginning of January to build two steamers for Glasgow owners. The dimensions of one vessel are:—Length, 105 ft.; breadth, 19½ ft.; depth, 8½ ft.; and of the other—length, 135 ft.; breadth, 22 ft.; depth, 10 ft. The firm have on hand at present a screw steamer measuring 135 ft. long.

Messrs. W. B. Thompson & Co., Limited, of Dundee, have contracted to build a steamer of about 900 tons for Messrs. M. Langlands & Sons, Glasgow, to be employed in the trade between Leith, Dundee, Aberdeen, and Liverpool. She will be fitted with tri-compound engines and every modern improvement.

Messrs. Cameron & Mills, who were connected upwards of eighteen years with the management of the dock, engine, and boiler works, Glasgow, carried on by the late firm of William King & Co.—referred to in our last month's notes as having been reorganised on the limited liability principle—have resolved on starting a similar business at Stanley Street, Paisley Road, West, under the designation of Cameron, Mills & Co. New plant and every modern requisite for the efficient conduct of a marine engineering business are being laid down, and the new firm begins operations with every chance of success.

The formal ceremony of cutting the first sod of new steel works to be erected at Motherwell, and carried on under the designation of "The Lanarkshire Steel Company, Limited," was performed on the 18th January by Mr. John Straus, C.E., of Glasgow, chairman of the company. It is intended to push forward the works as rapidly as possible, and hopes are entertained that they may be complete and ready for occupancy early in the summer.

In addition to the tube works recently started by Messrs. Stewart Bros., at Dundryan, Coatbridge, a large new tube works is about to be erected in that thriving town alongside the North British Railway, for Messrs. James McGhie & Co., presently of Coatbank Street. The new concern, which will be worked as a limited liability company, will provide employment for between 500 and 600 men.

Messrs. Stevens & Struthers, brassfounders in the Crastonhill district of Glasgow, have successfully completed the casting of one of the series of large castings for the Government cruisers, of which notice was taken in these notes two issues back. This first casting, which is of over ten tons in weight, is the stem of one of the three wood-sheathed cruisers building by the London and Glasgow Shipbuilding Co., at Govan. The metal of which it is made is composed of 90 per cent. of copper and the remainder of tin, with a very small part of phosphor added. This expensive alloy is used in the case of these castings, because, if steel were used, the galvanic action from the copper sheathing with which these cruisers are to be clad externally would lead to rapid conversion of the steel. The casting just completed is one of the largest, if not indeed the largest phosphor bronze casting ever made in the Clyde district, weighing, as has been said, over ten tons, it takes the form almost of two sides of a triangle, the apex forming what is technically known as the ram, while the bottom part is elliptical in form till it joins the horizontal keel of the vessel. From the connection with the keel to the ram the measurement is 23½ ft., and from the ram to the top of the stern 20 ft., making in all 43½ ft. The stern-posts, which Messrs. Stevens & Struthers have also in hand, are still more complicated, as provision has to be made for propeller brackets and rudder on the balance principle. The total weight of each stern casting is over thirty-one tons.

The Polmadie district of Glasgow, like that of Cranstonhill, is quite a beehive in the matter of engineering shops devoted chiefly to the manufacture of machine tools, and the smaller class of machinery. Messrs. Alley & MacLellan, of the "Sentinel" Works, who in addition to their separate barge building and boiler-making premises, have extensive engineering works, are extremely busy in both departments. They have recently engined a considerable number of vessels whose hulls have been built on the Tyne and Wear, and they have still numerous contracts on hand. Their speciality in steam steering gears—the "Sentinel"—is in great demand, and they find it quite impracticable to supply the gears with the promptitude desired. The firm have on order approaching 50 sets, and altogether since they introduced the gear, two and a-half or three years ago, about 250 sets have been ordered. A considerable demand also exists for their patent steam ash-hoist, a very useful stokehold auxiliary. Messrs. James Bennie & Sons, the well-known makers of heavy iron-working machine-tools, also in this district, are, like their neighbours, reaping benefit from the brisk times. One of their specialities, of which some are presently on hand, and a considerable number have been supplied to shipbuilders during the past year, is a heavy lever punching and shearing machine, adapted also for cutting intercostal and stringer-plate edges. The rivet punch of this fine tool is capable of piercing a 1½-inch hole through a 1½-inch plate at a distance of 42 ins. from the edge, while the shearing knife and stringer cutter are of equally heavy calibre.

Powers for the construction of a new and unusually large graving dock are being sought in the next session of Parliament by the Clyde Navigation Trust. The projected dock is to be situate alongside the two already in existence, and doing yeoman service on the south side of Glasgow harbour, near Govan. This dock, if constructed, will rank amongst the largest in the kingdom, the length of floor being 950 ft., the width at bottom 65 ft., and at top 106 ft. The width at entrance will be 80 ft., while the depth on centre of the sill at average high-water level of ordinary spring tides will be 25 ft. Unlike the largest of Glasgow's present graving docks (opened in 1883), which has a caisson at the entrance, the proposed docks will have gates. Mr. James Deas, C.E., the Clyde Trust engineer, seems, in the case of this projected dock, to be making ample allowance for the future development in marine construction.

The recently authorized tunnels under the river Clyde at Finnieston, where the need for cross-river communication has been long and keenly felt, have been relegated to the well-tried skill of Messrs. Hugh Kennedy & Sons, of Partick. This firm of contractors are now well known in connection with such undertakings. They have only recently completed the Gourrock section of the Caledonian line from Greenock to Gourrock, and in their part of the work was included the Newton Street tunnel, fully a mile in length. The promoters of the Harbour Tunnel scheme are a company of well-known local gentlemen, and the parliamentary powers conferred on them are to the effect that they may construct subterranean passages or tunnels at a sufficient depth below the bed of the river not to interfere with future dredging operations. The engineers are

Messrs. Simpson & Wilson, C.E., who have had large experience of such works.

Mr. W. T. Mumford, who, for about twenty years past has filled the important position of principal surveyor to Lloyd's Register in the Clyde district, has recently retired from active service. Mr. Mumford retires with a pension, and his successor in office is Mr. Thomas J. Dodd, who has been a prominent member of Lloyd's Glasgow surveying staff for upwards of ten years, and is personally known to the shipbuilders and shipowners of Glasgow and the west of Scotland.

The Watt anniversary has been celebrated by the engineers and shipbuilders of Clydeside in the time-honoured fashion—a lecture in Greenock and a dinner at Glasgow. The lecturer was Mr. James Riley, the able general manager of the Steel Company of Scotland, his subject being "Steel: its Manufacture, Properties, and Uses." While dealing with the subject in a manner calculated to interest a general audience, the lecturer gave deliverances on the subject of "basic" steel and of "nickel steel," which cannot fail to attract the attention of all who are technically and commercially concerned in this important manufacture. The dinner in the Grand Hotel, Glasgow, was, as usual, attended by very many of the members of firms and heads of departments of the shipbuilding and engineering works of the West of Scotland. Mr. Ebenezer Kemp, President of the Institution of Engineers and Shipbuilders in Scotland, occupied the chair, and in the course of the proceedings gave the usual eulogistic toast of "The Memory of James Watt." One practical outcome of this year's celebration is likely to be some tangible and definite scheme for a fitting memorial to the great engineer—a subject which has been exercising Clyde engineers, and especially the inhabitants of Greenock for a considerable time past.

## TRADE NOTES FROM THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—Though it is well understood that enquiries for cargo boats have fallen off, a few orders for vessels of a special class have been placed during the past couple of weeks. One of these, which is for a passenger steamer of large size, has, it is understood, been secured by Messrs. Swan & Hunter, who last year turned out some very superior vessels. Messrs. Hawthorn, Leslie & Co. launched, late in the month, a first-class steamer of exceptionally large proportions, which has been built to the order of foreign owners, and is intended for employment in the dead meat trade. The firm are fitting out beside the yard the fine steamer *Morayshire*, which was launched in December, and are also putting the finishing touches to a large Russian steamer, which was put off the stocks earlier in the year. Messrs. R. Stephenson & Co.'s yard looks somewhat bare at present, there being only two vessels on the stocks. One of these, however, is an important contract, being a cruiser of the second-class, which the firm have been commissioned to build for the Admiralty, and which is already sufficiently advanced to admit of protective deck plating being proceeded with. The Palmer's Shipbuilding & Iron Co., Limited, have all the berths of their Jarrow yard occupied, most of the vessels being yet in very early stages. In the frame bending department, night work is maintained, and the same remark applies to the Howdon works of the firm. Messrs. Armstrong, Mitchell & Co. are getting ready for sea the large steamer *Ville de Douay* at their Low Walker yard, and have on the stocks some half-dozen vessels of a very large class, besides three or four others of average proportions. The Tyne Shipbuilding Co., who launched eight large vessels last year, have just made a good contribution to their possible record for the current year, by the launching of a fine vessel, ordered by Glasgow owners. The remaining vessels on the stocks, which are three in number, are all of large size, and the firm have several other large ones to put down. Messrs. W. Dobson & Co. have put a vessel off the stocks this month, and are finishing beside the yard two others that were launched last year, having been built to the order of foreign owners. The firm have now four vessels of various sizes in different stages of construction on the stocks. Messrs. W. Richardson & Co. are completing, in the river, the s.s. *Lyeemoon* and the s.s. *Hornby Grange*, the first of which is a foreign, and the second a British owned steamer. The firm have, on the

stocks, or in preparation for laying down, several other vessels of a special class, some of which are of unusually large dimensions. Messrs. Wood & Skinner are proceeding with extensions which will add considerably to the productive capacity of their establishment, and the output this year is likely to be much larger than that of last year. The Edwards Shipbuilding Co. are also likely to greatly increase their production this year, as compared with last year's output, which only reached 6,000 tons. The company have now vessels on the stocks to represent more than double that amount of tonnage, and these will be succeeded by others before the end of the year. Messrs. John Readhead & Sons, who last year occupied a conspicuous position in the output returns, having launched a steamer each month, the aggregate tonnage of the whole reaching the large figure of 26,000 tons, have an excellent prospect for the present year, all the berths being filled with vessels of large size, and frame bending operations being kept on both night and day. Messrs. Schlessinger, Davis & Co. have some berths vacant, but will doubtless have them occupied very shortly, and Messrs. T. & W. Smith have a fair quantity of both old and new work in progress. Before leaving the subject of shipbuilding, it may be stated that at the opening of the year the wages of the operatives in the iron and steel departments were increased to the extent of five per cent., and other classes of operatives are now looking for advances. The cost of production will, of course, be correspondingly increased, and the tendency to speculative building will, undoubtedly, be checked in proportion. This, indeed, is the prospective contingency which is likely to keep labour claims within reasonable bounds, as it is believed that even the rates of 1882 would be exceeded if speculation were to be as rife as at that memorable period. A conference between representatives from the newly-formed Federation of Shipbuilders and Engineers and the leading officials of the Boilermakers' and Iron Shipbuilders' Society took place at Newcastle on the 21st inst. with reference to the apprentice question. The result of the discussion which took place was: that those shipbuilders who are not at present conforming to the regulation of the society—which requires that only one apprentice shall be employed for every four workmen—have agreed to do so, one firm at Belfast promising to reduce the number of apprentices employed by them at the rate of ten per month for the next six months. The operatives at the yard referred to have been on strike for some time in reference to this question, but the arrangement now come to will, no doubt, put an end to the dispute.

**Engineering.**—The operative engineers engaged in the Tyne engine works have asked for a wages advance of 2s. per week, to fall due on February 1st. They have made a further claim for the substitution of twelve o'clock instead of one p.m. as the stopping time on Saturdays, thus reducing the working hours from fifty-four to fifty-three per week. With reference to the first claim, the employers have made an offer of 1s. per week, but so far as regards the working hours they have intimated their disinclination to make any departure from the present arrangement. Meetings of the men are being held at the different centres to consider the employers' offer, but at the time of writing no reply from them has been received. At all marine engineering works business keeps exceedingly brisk, and night work is very generally continued. Boilermaking establishments are also having plenty of work. The Tyne Boiler Works Co., Low Walker, and Messrs. Eltringham & Co., South Shields, being particularly busy in the marine line. Messrs. John Abbott & Co. have some large stationary boilers in hand, and the same firm have an abundance of work in their engineering, iron founding, and chain and anchor making departments. Messrs. Black & Hawthorn, who turned out a large amount of marine work last year (both engines and boilers), are still very busy in the same line, and have also a good deal of general engineering work in hand. Messrs. Emerson, Walker & Thompson Brothers, Limited, have lately received further important orders for windlasses and other specialties, and the greatest possible activity exists throughout the whole of the departments of their extensive works. Messrs. Carrick & Wardale are very busy with the manufacture of their patent single and double-acting steam-feed bulge and ballast pumps, and are also well supplied with orders for plant used in chemical works. Messrs. H. Watson & Sons, of the High Bridge Works, Newcastle, have numerous orders for their special steam pumps for use on shipboard, as also for side lights, deck-house lights, valves, and other specialties. Messrs. Mills & Co., brass finishers, &c., who formerly carried on business in the vicinity

of Messrs. Stephenson's works, Newcastle, but who had to remove from there owing to the site of their premises being required for railway extensions, are building a large factory at Walker Gate, which is expected to be ready for productive operations in the course of a few weeks. Messrs. Donkin & Nichol, of the St. Andrew's Engine Works, are doing an exceedingly active business in the manufacture of steering gears, ash-hoists, and engine-room telegraphs, and Mr. Thomas Boydell, of 27, Bath Lane, is also well employed in the latter line. The magnolia metal for lining engine bearings, with a view to minimise friction and prevent heating, is now being very largely used in the district, and the agents, Messrs. Allen & Robson, of 30, Dean Street, are actively extending their sphere of operations in connection with its distribution.

#### THE WEAR.

**Shipbuilding.**—Since the opening of the year, it has transpired that Messrs. W. Doxford & Sons have been successful in obtaining an order for two large vessels from the British India Steam Navigation Co., and as the firm have, in addition, a good many orders for cargo boats, more than ordinary activity is certain to exist at this establishment during the remaining eleven months. Messrs. Short Brothers have all their berths occupied, the vessels on the stocks being mostly for local owners, and they have plenty of orders in hand to fill the vacancies caused by launches for many months to come. Messrs. Pickersgill are putting down new plant in their recently added premises, and they will doubtless take a more conspicuous position in the output returns for the current year than they have hitherto done. At Mr. Laing's yard there are two or three high-class boats in progress, besides others of the ordinary cargo type. Night work is maintained in the frame bending department, and appearances generally point to the continuance of great briskness in the yard during the whole of the year. Messrs. R. Thompson & Sons launched on the 23rd inst. a handsome vessel intended for laying submarine telegraph cables, and it is understood that they have another of the same type to build. The repairing branch of the firm's business has been very active lately, an extensive overhaul of a Lambton steamer having been one of the principal contracts dealt with. Messrs. J. L. Thompson & Sons, who for several years past have headed the list of output returns for the river Wear, are pretty certain to retain this enviable pre-eminence, as they show no disposition to lag behind in the adoption of improvements calculated to expedite production. The firm have launched their first vessel for the year, and have one or two others in very advanced stages. They have also a good deal of repair business, and though they have as yet no graving dock of their own they manage by utilizing the Wear Commission Docks, and with the aid of the special facilities they possess at the Manor's Quay establishment, to get through a very large amount of this class of work. At the Strand Shipbuilding Co.'s yard, and also at Messrs. Austin's and Messrs. Blumer's establishments, the berths are all occupied, and business keeps pretty brisk. The Sunderland Shipbuilding Co. are now getting ready for sea the passenger steamer *Messapia*, which has been built to the order of Italian owners, and was launched late in December. The firm are now utilizing the whole of their building space, some of the vessels on the stocks being of large dimensions. A powerful hydraulic machine for bending steel plates while in a cold state is being placed in position. The manufacturers are Messrs. Hugh Smith & Co., Possil Works, Glasgow. Messrs. Bartram, Haswell & Co. have two large vessels on the stocks. The platers' helpers in the Wear yards, who lately asked for an advance of 15 per cent. in the wages rates, have accepted an offer made by the employers of 1s. per week advance. This brings the rate for outside helpers up to 30s. and for furnace helpers up to 83s. per week, which rates are the same as were paid in 1882.

**Engineering.**—It is understood that Messrs. Doxford have the contract for the engines, as well as the hulls, of the two vessels previously mentioned as being ordered from them by the British India Steam Navigation Co. Messrs. Clark & Co. have also some engines of a special class in hand for vessels building by Mr. Laing. The North-Eastern Engineering Co. are quite full of work, and the same remark applies to Mr. Dickinson's establishment, Palmer's Hill. In the boiler-making department of the last-named works the labourers have been on strike for some days, owing, it is alleged, to the discharge of one of the officials. This appears to be one of the unwisely infrequently entered upon, to make an

illegitimate use of the power of combination, and from the point of view of impartial outsiders, it does not deserve to succeed. Mr. John Wigham, of the Hylton Slipway and Engine Works, has now in hand several compound steam winches for the Continent, and has lately supplied a considerable number, of the same type, to the steamers of Mr. James Westoll's fleet and to other locally owned vessels. It is understood that the same manufacturer has one or two sets of small marine engines to build, and his place is just now exceedingly busy. In the forges and foundries extraordinary activity continues to exist, and chain and anchor works keep busy. Mr. William Mills, patentee of the well-known engaging and disengaging gear for ships' boats, has commenced the manufacture of the gear in extensive premises at Bridge Crescent, Sunderland, and is now doing an exceedingly active business. The gear has been adopted by many of the leading shipping companies for their steamers, and more especially by the telegraph companies, in vessels engaged repairing submarine cables. It is also in use on warships belonging to the Spanish, Swedish, and Chinese Governments, and appears to have given satisfaction in every case where it has been adopted.

**The Hartlepool.**—Messrs. W. Gray & Co. have received an order from a local company for a vessel which is to be over 400 ft. in length, and which, it is said, will be one of the largest yet built at the port. The vessel will be fitted up for the accommodation of passengers as well as the conveyance of cargo. It is to be built at Messrs. Gray & Co.'s Central Yard, and the keel has already been laid. The firm have several other vessels of large size on the stocks, and are engaged in carrying out important repairs to the steamers *Ringwood*, *Eclipse*, and others. Messrs. Withey & Co. have lately made very important alterations in their yard, which have placed at their disposal a large amount of additional space, and will generally help to facilitate production. Messrs. Irvine & Co., who, though well known as builders of new vessels, have hitherto devoted themselves largely to repair work, are now apparently determined to make the former line a more prominent feature of their business. With this object in view they are laying out an additional building berth (which will make three berths in all) and are otherwise improving the working arrangements of their establishment. They are also building new offices, which will shortly be ready for occupation. The firm, on the whole, appear to be making a new departure, which involves a greatly extended development of business, along with its attendant risks. They have, however, chosen an auspicious time for the purpose, and little doubt can be entertained of satisfactory results being achieved. In the engineering establishments business is still very active, and during the month some large vessels received their machinery at the Central Marine Works. During December, Messrs. Thomas Richardson & Sons supplied engines of the triple-expansion type, with boilers, &c., to the following vessels:—

The s.s. *Sheerness*, having cylinders 21 in., 35 in., 58 in. by 36 in. stroke, and two large single-ended boilers. The s.s. *Tunbridge*, having cylinders 22 in., 35 in., 59 in. by 39 in. stroke, and two large single-ended boilers. The s.s. *Verax*, having cylinders 22 in., 35 in., 59 in. by 39 in. stroke, and two large boilers. The s.s. *Culgoa*, having cylinders 28 in., 44 in., 72 in. by 4 ft. stroke, and two double-ended boilers of large size. The s.s. *Beatrice*, with cylinders 16½ in., 26½ in., 45 in. by 33 in. stroke, and one large single-ended boiler. During the months of December and January the following vessels, engined by Messrs. Richardson, have had their trial trips, the result in each case being completely satisfactory:—The s.s. *Palatino*, built for Messrs. Glynn, of Liverpool, on December 8th. The s.s. *Sheerness*, owned by Messrs. Sanderson & Co., of Hull, December 14th. The s.s. *Glenartney*, of the well-known "Glen" line of steamers, on December 20th. The s.s. *Tunbridge*, belonging to Messrs. Temperley, of London, on December 21st. The s.s. *Verax*, owned by Messrs. George Horsley & Sons, Hartlepool, on January 1st. The s.s. *Culgoa*, owned by Messrs. W. Lund & Co., London, on January 5th. The s.s. *Beatrice*, for Michael Murphy, jun., Esq., Dublin, on January 10th. The s.s. *Matatua*, owned by Messrs. Shaw, Saville & Co., of London, on January 14th. The steelworks at this centre continue in full operation, and ropeworks are very actively employed.

**Stockton.**—Shipbuilding on the Tees continues very active, and the same remark applies to marine engineering. Messrs. Blair & Co. have most of their departments working night and day, and the staff of hands employed is unprecedentedly large. Since December 19th the following vessels, engined by the

firm, have had their trial trips:—The s.s. *Eon*, built by Messrs. Ropner & Sons, of Stockton, for Messrs. Newman & Dales, Newcastle, having engines of 160 H.P. nominal, with cylinders 21 in., 35 in., 57 in. by 39 in. stroke. The s.s. *Sandfield*, built by Messrs. Withy & Co., West Hartlepool for Frederick Woods, Esq., of London, having engines of 155 H.P. nominal, with cylinders 21 in., 35 in., 57 in. by 36 in. stroke. The engines for both these vessels are constructed to work at 160 lbs. pressure of steam, and on their trials gave the greatest satisfaction to those interested.

**Middlesbro'.**—No new contracts have been entered into by the Middlesbro' shipbuilders lately, owing chiefly to the fact that having plenty of orders to carry them through more than half of this year, they could not guarantee delivery at a sufficiently early date to satisfy enquirers. The establishment of Messrs. Raylton, Dixon & Co. continue to exhibit the same activity that has existed in them since the improvement in trade commenced. The firm have vessels in all stages of construction from frame turning to the putting on of the final touches, and appearances indicate that the output for the present year will equal, if not exceed, that of the last year, as their new, or supplemental yard is now in full swing, and they are arranging to provide an additional building berth. Messrs. Scraggs & Sons have two vessels in the framing and plating stages respectively, at their Middlesbro' yard, and at their Stockton yard a good deal of work is also in progress. Messrs. W. Harkess & Son are busier than at any previous period of the firm's history. They have launched this month a steel steamer of 1,800 tons carrying capacity, and have another ready to launch next spring tides. They are now turning frames for two vessels (sister ships), and the frame-men are working late nightly. They have other important orders on their books, and their new work is sufficient to last over the greater part of this year. They have also had, this winter, a good share of repair work, which constitutes an important feature of their business. Owing to the occurrence of a fire on the premises towards the close of last year, the joiner's shop, as well as a large machinery shed, and a quantity of work which was ready for vessels on the stocks, were completely destroyed. The shops are now being rebuilt, and advantage is being taken of the circumstance to add a spacious moulding loft. Alterations in the machinery and general working arrangements of the yard are also being carried out, with a view to secure quicker and more economical production than was possible under the conditions which existed before the occurrence of the fire. Several new machines are to be put down, and the frame furnace is to be provided with bending blocks at both ends, to facilitate the work of frame turning.

**Darlington.**—At the Darlington Forge Company's Works the greatest activity is still to be noticed, and as the company are receiving numerous enquiries in respect of their special products, the present prosperous state of business may be expected to last for a long time to come.

## NORTH-WEST OF ENGLAND.

**Barrow-in-Furness.**—The shipbuilding industry in this district has not undergone any material change during the past month. The yards in this district have all been well employed, with the single exception of Caird and Purdies, which has done no work for several years past. At the Naval Construction and Armaments Co's. Works, at Barrow, greater and greater activity has shown itself as the orders in hand got better forward. The chief feature in the yard at the present is that relative to the building of three Canadian Pacific Railway Co's. steamers, which have to be delivered in about a year from this time. The great difficulty experienced by builders towards the close of last year was in the scarcity of supplies of material. This to some extent has now been remedied, and platers, riveters, drillers and others engaged in ship construction are now regularly employed, the result will be that in all probability that large ships will be launched before the close of the year; doubtless, one of two of the second-class cruisers, which are also making considerable progress. Next month the *Commaic*, the fourth steamer built for Messrs. Elder, Dempster & Co. by the Naval Construction and Armaments Co. will be launched, and it is quite on the cards that two other similar steamers will be built at Barrow for the

same company. Other important orders are pending, and it is probable that new contracts will be given out by shipowners now that the market is somewhat easier. The value of plates has come down to £8 15s. per ton, and angles to £7 15s., but it is not yet possible to place large orders for these as makers are very busily employed and have contracts in hand which will furnish employment for their mills for some nine months to come. Several shipbuilders are anxious to place large orders for steel, it is evident if deliveries could be secured, and if prices remain at about their present figure a large number of orders for ships could be obtained, but as builders' hands are at present, generally speaking, so full of orders there is not much fear of any pressure on the part of builders to secure new work, especially as the temper of the men is an unknown quantity. It is never known how long satisfactory relations can be maintained, and the slightest move in the price of material or in the cost of labour runs away with all the profit. The difficulty the Barrow company had with the pattern-makers and joiners has been settled on amicable lines, but the work of making the patterns of the large castings in the shipbuilding department will in future be done by pattern-makers and not by joiners. Some orders have been secured in the marine engineering department for triple-expansion engines, and new high-pressure boilers for old steamers. It is stated that the Pacific Steam Navigation Co. will have two of their old steamers, now engaged on the mail service between here and South America, fitted with new engines, and the satisfactory results which have followed the adoption of this principle on several steamers employed on long voyages, is directing the attention of shipowners to the alternative of modernising old steamers in this way in preference to the building of new ones. The new firm of Westray, Copeland & Co. has been floated as engineers at Barrow. They have secured large and important premises at an easy price, and they are likely to obtain a large share of work in the general as well as in the marine departments.

## THE MERSEY.

**THE** largely increased cost of shipbuilding as a necessary result of the enormous advance in the price of all descriptions of material and the considerably higher rate of wages that have now to be paid to the men, is naturally inducing some hesitation in the placing out of new ships. Although it can scarcely be said that there is any appreciable slackening off, so far as the present activity of trade is concerned, here and there shipbuilders report a decreasing weight of inquiries, and fewer new orders in prospect. The replacing of steamships on passenger lines, rendered necessary either through wreckage or other causes, of course, compels orders for new vessels to be given out, under these circumstances, almost irrespective of price, but when no actually pressing need for building exists, there is a disposition to wait with a view of testing whether the present high prices, which no one certainly anticipated less than twelvemonth's back, are likely to be really permanent. So far, however, as present indications afford a means of judging as to the probabilities of the immediate future, there would not seem to be much ground for anticipating that orders, which are now being held back, are likely, for some time to come, to be placed on more favourable terms than the present. Certainly, for the moment there is a pause in the recent too rapid upward movement in the price of materials: but manufacturers of iron and steel are in the position that, whilst the already increased cost of raw materials, and of fuel, together with the advanced rate of wages, must effectually prevent their receding from present prices, they have to face the probability of still higher wages, and still dearer fuel, especially so far as coke is concerned. Shipbuilders, themselves, have also to meet continued demands for higher wages, and since the commencement of the year, a further advance of 5 per cent. has been conceded to the men engaged in the shipyards on the Mersey, making a total advance of fully 25 to 30 per cent. during the last twelve months. It is, however, not only in the heavy structural work of shipbuilding that all these conditions are operating against lower prices being possible, at any rate, for the present. The same remarks apply to marine engineers, who have not only to pay equally high prices, so far as all descriptions of material which they use are concerned: but with regard to wages, matters are still more complicated, owing to the independent and frequently conflicting action taken by the respective societies to

which the workmen in different departments belong. The allowances for overtime have been a particularly troublesome question, each society insisting upon making its own arrangements, involving the attempt on the part of one set of workmen to secure more favourable terms than have been conceded to men in other departments; and just now the moulders in some of the workshops have a dispute on this question which is entailing considerable inconvenience in the execution of orders in hand. In fact, so much confusion and discontent has been the consequence that in some instances employers, whilst perfectly willing to meet the legitimate demands of the workmen for increased remuneration, absolutely decline to enter into further negotiations, unless the whole question is dealt with collectively by the workmen, and on a basis which shall be fair and satisfactory to all concerned. Taking all these circumstances into consideration, the only conclusion which can be arrived at is that unless there is to be some altogether unexpected collapse in trade, present prices must not only be maintained, but there is more than a probability that further advances will be necessary, and when this is fully recognised there is no doubt that many orders which are now being held back will be placed without further hesitation, so that any falling off in the weight of new work actually being offered just at present is not likely to be more than temporary. All the shipbuilding yards on the Mersey continue as fully occupied as it is possible for them to be; and the same may be said of the repairing yards, the increased cost of new ships necessarily making owners anxious to keep all their existing vessels afloat. Messrs. Thomas B. Royden & Sons are exceedingly full of work, and last week launched the third of a fleet of exceptionally large steam cargo ships, which they have built for the Steam Ship Co., Limited. This vessel is called the *Indrapura*, and is built throughout entirely of steel. Her length is 370 ft., width of beam 46 ft. 8 in., and depth 28 ft. 6 in., and she is to be fitted with engines made by Messrs. Fawcett, Preston & Co., of Liverpool, which are on the same pattern as the engines supplied by the above firm to the two sister ships *Indra* and *Indiani*. These are triple-expansion engines with 27 in., 44 in., and 71 in. cylinders, with 4 ft. stroke, working at a pressure of 150 lbs., and giving 1,800 I.H.P. The vessel is also fitted with Messrs. Clarke, Chapman & Co.'s steam winches. As an indication of the character of these large vessels, which have been built specially for the Indian trade, a few details respecting the two previous ships already referred to may be interesting. These were not quite so large as the ship which has just been launched, the length being 360 ft., breadth 44 ft., depth 30 ft. 2 in.; gross registered tonnage, 3,582 tons; net registered tonnage, 2,382 tons; and dead-weight to be carried, with a draught of 24 ft. 7½ in., 5,652 tons. The summer free-board, according to Lloyd's rules, is 6 ft. 4½ in. The engines have a total heating surface of 5,429 square ft., the condenser a surface of 2,800 ft., whilst the boiler pressure is 150 lbs., and the I.H.P. 1,750. Another vessel in hand is an iron steamer, also intended for the Eastern trade, but as a passenger vessel. This is being built for Mr. Alfred Holt, and is 252 ft. long, 38 ft. in the beam, and 24 ft. high. She is to be called the *Saracen*, and will be launched in about a month. The engines for this vessel are also being built by Messrs. Fawcett, Preston & Co., Limited, and are of the ordinary compound type, with cylinders of 22 in. and 55 in. diameter, with 40 in. stroke, and working at 150 lbs. pressure. Another vessel just commenced is a steamship of steel, for the Brazilian passenger trade, for Messrs. R. Singlehurst & Co. This vessel is 300 ft. long, 37 ft. in the beam, and 26 ft. deep. The engines, which are being built by Messrs. Fawcett, Preston & Co., are triple-expansion, with cylinders of 29 in., 46 in., and 74 in. diameter respectively, and 4 ft. stroke, working at a pressure of 175 lbs. Another vessel in hand is a four-masted steel sailing ship, for Messrs. Macvicar, Marshall & Co., of Liverpool. This vessel is also intended for the Eastern trade, and will be 297 ft. long, 44 ft. 3 in. beam, and 24 ft. deep, with a registered tonnage of about 2,600. Messrs. W. H. Potter & Co. are also very full of work, having in hand one iron sailing vessel, 2,500 tons; another sailing vessel constructed of steel of 2,800 tons; and an iron steamer of 1,000 tons for Mr. Alfred Holt, with engines of 100 I.H.P., which are being built by Messrs. Fawcett, Preston & Co., Limited. These engines are of the type, with cylinders of 21½ in. and 46 in. diameter, oke, working at a pressure of 100 lbs. to the square inch, for marine engineering works on the Mersey keepish orders, and in addition to the engines which

Messrs. Fawcett, Preston & Co. are building, as recorded above, they are just now very busy in their boiler departments, both on the construction of boilers for new vessels and replacing existing boilers on steamships by new ones constructed of steel, and of much higher working pressure, ranging from 160 lbs. to 170 lbs. per square inch.

Throughout the Manchester district all the engineering firms engaged on marine work are kept exceedingly busy, and in most cases are unable to book new orders for any reasonably early delivery. The great advance which has taken place in the price of material is, however, tending to check the placing out of exceptionally heavy tools, and here and there orders which would otherwise have been given out are for the present held back.

As a speciality for marine engines it will be of interest to draw attention to the patented packing introduced by the "Frictionless Engine Packing Co.," of Manchester. The body of this packing is constructed of flax yarn, but the chief feature of it is that a special material is spun into the yarn in the course of manufacture which provides the lubrication. This material possesses the properties that it will neither burn nor melt, and after long usage still retains sufficient lubrication to preserve its efficiency as a packing in the engine. It is well known that with many of the ordinary engine packings after they have been in use a certain time, whatever lubrication they may have possessed at the commencement is melted out by the steam-heat and the friction in the cylinders, leaving a hard, dry fibre, which, for the safety of the engine, has to be removed. We have seen samples of the packing produced by the "Frictionless Engine Packing Co.," which had been in use on board ocean-going steamers for six and nine months, and which after this period had suffered no serious detriment in their lubricating properties. One sample had been in use for six months on the steamship *Concordia*, owned by Donaldson Brothers, of Glasgow, and another nine months on the steamship *City of Khos*, and certainly, judging from the condition in which the packing remained after this prolonged test, it was a conclusive proof that the company have succeeded in producing a perfect lubricating packing, each fibre of which carries its own lubrication, that no pressure of steam or heat can melt out. In addition to the steamers we have already mentioned, this packing is largely used by Messrs. D. W. Henderson, D. Smith & Sons, of the City Line, and the Clyde Shipping Co. It obtained the highest awards at the Edinburgh Exhibition, 1886, Saltaire Exhibition, 1887, Newcastle Exhibition, 1887, the Birmingham Exhibition, 1889, and the Paris Exhibition in the same year. It was the only packing used at the Manchester Exhibition in 1887, where it was awarded a memorial diploma: and we understand it has been selected as the packing to be used at the Edinburgh Exhibition this year.

In the iron market there is just for the present a general lull in the demand, with some easing down in prices. This, however, is due mainly to recent speculative operations in warrants, in which there has been a very considerable drop, until they are being offered at very much below maker's prices, and there is a good deal of iron held in second hands also being forced upon the market at low figures. Makers, however, generally hold pretty firmly to late rates, although no doubt they would be much more disposed to entertain offers than they have been recently. The giving way in prices is more in pig than in manufactured iron, but some of the local finished iron makers would now be disposed to entertain actual specifications at under their quoted list rates of £8 15s. per ton for bars delivered in the Manchester district.

In the steel trade there is also a rather easier tone, hematites having given way slightly upon the top figures which have been quoted of late, and manufacturers of steel plates have not been able to maintain the advanced rates which they have been attempting to obtain during the past month. For delivery, ex-steamers Liverpool, Scotch makers quote ordinary steel ship plates at £10 7s. 6d., steel boiler plates, £11 7s. 6d., angles and plain bulbs, £9 2s. 6d., tees, £10 7s. 6d., round and square bars, £9 12s. 6d., and flat bars, £9 12s. 6d. less 2½ per cent. There are moderate enquiries stirring, but the weight of actual buying going on just now is not very large.

During the past month there has been a continued brisk demand for all descriptions of metal goods, with manufacturers so fully booked for their present production over a considerable period, that buyers have had the greatest difficulty in placing orders for anything like early delivery. Prices have again moved upwards, the list rates for delivery equal to Manchester

having been further advanced  $\frac{1}{4}$ d. per ton. This brings quotations to the minimum basis of  $7\frac{1}{4}$ d. for solid drawn brass boiler tubes,  $9\frac{1}{4}$ d. for solid drawn brass surface condenser tubes,  $10\frac{1}{4}$ d. for solid drawn copper tubes,  $9\frac{1}{4}$ d. for braised copper steam tubes,  $8\frac{1}{4}$ d. for braised brass machine tubes,  $7\frac{1}{4}$ d. for brass wire,  $9\frac{1}{4}$ d. for copper wire,  $7\frac{1}{4}$ d. to  $7\frac{1}{2}$ d. for rolled brass, and  $8\frac{1}{4}$ d. for sheet brass. Where, however, buyers require special deliveries, manufacturers in most cases would hold out for something above these figures. Cast composition sheet nails and spikes are now quoted at 8d. per ton, cast red-metal at  $10\frac{1}{4}$ d., wrought copper rivets and washers  $10\frac{1}{4}$ d. per lb., wrought copper boat nails from  $10\frac{1}{4}$ d. to  $11\frac{1}{4}$ d. per lb. according to sizes.

The giving way which has since taken place in copper is, however, tending to check business, and with the close of the month there is not much buying going on at the advanced rates above quoted. Manufacturers, however, are so fully sold that they are quite independent of further orders just now, and hold firmly to their full rates.

The coal trade is considerably quieter as compared with the commencement of the year, and supplies of all descriptions of fuel are plentiful in the market, with an easing down in prices from the top figures recently quoted. For shipment there is decidedly less enquiry and steam coals delivered at the ports on the Mersey, although still quoted at 11s. 6d. to 12s. per ton, could now be readily bought at under this figure.

In the timber trade imports generally have again been heavy, and although deliveries have been large, values have with great difficulty been maintained, and in some instances have actually declined. The import season has now closed, but stocks, as a rule, are too heavy. The aggregate tonnage to the close of last year was 533,206 tons, as compared with 410,424 tons in 1888, and 369,590 tons in 1889.

### WELSH NOTES.

**T**HERE has just been registered a Welsh Colliery Company under the style of the Glyncorrwg Colliery Co., Limited, with a capital of £200,000. The *Financial Times* is down upon the old friend with a new face and asks, or at any rate suggests, some very pertinent enquiries. The old Glyncorrwg Co. had a capital of about £70,000—why then the increase of £130,000? 'To bolster up the South Wales Mineral Railway, our contemporary suggests seeing that the new company has power to buy shares in and advance money to this particular railway enterprise. But however this may be, there is one stubborn fact in connection with the company, and it is that the coal is good, and that is much more than can be said of the black diamonds produced by some Welsh Colliery Companies.

Another colliery company registered during the past month is the Universal Steam Coal Co., which has a capital of £100,000 in £100 shares. This company is not to take over an existing colliery, but is to sink its own pits. We presume the idea is to have a colliery to sell by the time the next big rise in coal takes place.

The trade of Swansea Harbour for 1889 compares favourably with that of 1888. The total tonnage for the first-named period was 1,295,083, and the dues received £27,469 11s. 6d., against 1,233,371 tons and £25,713 11s. 2d. in 1888. The year is the best one the port has had, which is all the more noteworthy seeing that in 1889 considerable reductions in dues were made.

The new year came in with great appearance of a strike speedily taking place in the local coal trade, and had the ever-busy agitators had all their own way there would have been a strike, but the men were wiser than their leaders, and by a majority of over 27,000 votes decided to accept the increased wages offered by the masters.

Cardiff coal trade again shows an increase although when the figures are carefully examined the Cardiff man, or more properly the men who pin their faith to the Bute interest, have little cause for pleasure. In 1889 Cardiff shipped foreign 9,000,543, an increase of 473,727 tons. The increase in the coastwise shipments was 1,201,288. But the Barry shipments are included in the Cardiff figures, and it was pointed out by one of those present at the Chamber of Commerce meeting, where the figures were given, that if the Barry shipments were deducted, Cardiff's coal trade would show an actual decrease.

Newport's coal shipping trade shows a decrease of 111,621 tons, or 5 per cent. But this is not much to be wondered at when we find that the colliery owners will ship coal at Cardiff for from 3d to 6d. less than they will from Newport. The fall of the year at Newport showed an improved trade, but it remains to be seen if this improvement will continue. Up to October the shipments of the place showed a decrease of 6 per cent., so that 1 per cent. of leeway has been made up. But there can be no gainsaying the fact that the traders of Newport have ample cause to complain of the way in which they are handicapped by the local dock authorities. Of course, the latter will feel the pinch as well as the traders, but there is very small satisfaction in that. Other trades in Newport are, however, looking up. Mordey, Carney & Co., Limited, are very busy at their ship repairing yard, and the Ukside Engineering Co. have found it necessary to enlarge their premises.

The boilermakers and engineers of the district have been busy trying one another's strength during the month, but the fight got no further than Swansea, where it was started. The boilermakers employed at the ship-repairing yards gave notice that after the 12th January they would claim for their men the making, sharpening, and repairing of all tools used in the course of their work. The work had up to then been done by the members of the Amalgamated Society of Smiths and Engineers, as is usual throughout the country. Naturally members of the society in Swansea saw no reason why they should give up their rights, and appealed to the masters to help them. This the latter decided to do, with the result that all the boilermakers in one yard threw down their tools and left the yard, as well as on the job upon which they were engaged. The Engineers' Society got at once the necessary number of non-Union men to complete the job, but threats of boycotting were made by the boilermakers; the shipowners grew afraid, and took the ship about which the dispute had arisen to Newport to repair. This was only a partial victory for the boilermakers, however. All the other employers in the town gave them notice that if it came to a question of which men should strike they would support the engineers and introduce non-Union men to do the ship-repairing work. The result was the objectionable demand was withdrawn; the non-Unionists left the town, and now things are quiet. There can be no denying the fact that the boilermakers acted in a most unjustifiable manner, and weakened their cause in Swansea very considerably. They continue their old course of boycotting all ships repaired by a non-Union yard at Newport, and altogether are acting in a very high-handed manner. There can only be one end to this sort of thing. If it is illegal to boycott in Ireland it should be equally illegal to boycott in this country, and the Government should make the Boilermakers' Society aware of this fact.

Swansea men are still busy with their iron speculating, but unfortunately for them prices are going against them. For those who are not concerned in this class of speculation, the faces of the small men who have assisted the rise in iron afford endless punishment. From one single glance one can see if warrants are up or down. Ah, well! it does not matter much. Their faces will be long enough by the time the bears finish their squeezing.

The Rhymney Railway directors recommend a dividend at the rate of 6 per cent. per annum for the past six months on the ordinary stock. After paying this there will remain a balance of £2,283 to be carried forward.

Cardiff coal prices keep up, but freights unfortunately show no improvement, and it is not expected that any change for the better will be experienced until the opening of the Baltic.

In tin plates there is little new to record. Prices show no mad desire to reach the figure they should stand at after the great rise there has been in raw material.

We understand that an attempt is being made to float a small company for the purpose of erecting some new patent fuel works at Briton Ferry. The process is an entirely new one. At present patent fuel consist of a mixture of small bituminous and steam coal and pitch; the new fuel is to be made of anthracite, small coal, wood, pitch and charcoal. Hopes of 30 per cent. dividend are held out, but the promoters might just as well tack on another 40 per cent., seeing that the inventor says he does not care to say how much profit will be made. Were he to speak the truth, he continues, the profit would appear so large as to cause disbelief.

The Newport Harbour Commissioners have decided to take some definite action with a view of deepening the river Usk. What will actually be decided we are not in a position to say.

## BELFAST TRADE NOTES.

TRADE here is still in the same prosperous state, and the number of ships launched keep all hands in the engineering business fully employed, and Irish shipbuilders have every reason to be satisfied with their turn out of tonnage during the past year, and are looking forward to another equally good one. Messrs McIlwaine & McColl, Limited, sustained a severe loss by fire on the 3rd inst., when the drawing office and pattern shop of their engine works were destroyed. The fire is supposed to have originated in the adjoining copper works of Messrs. Cleland & Thorburn, which were entirely destroyed. Machine and tool makers are very actively employed, and in some cases large foreign orders are in hand.

The death of Mr. T. S. Dixon, J.P., of the Irish Shipowners' Company, took place during the past month, and his presence in shipping circles will be missed in Belfast.

The Corporation are now promoting a bill in order to obtain a loan to purchase the White Linen Hall and erect on the site a new City Hall and Municipal Offices. Owing to its central situation it will be in every way more accessible than the present one.

## LEITH NOTES.

THE trade here was very quiet at the beginning of the month, owing to the holidays, but the old briskness is now resumed, and one or two new orders have been placed, Messrs. Hawthorn's & Co., Leith Engine Works, Leith, having contracted for two sets of engines and boilers, one compound and the other triple expansion; a large amount of repairing work is also distributed amongst the various firms here.

The port of Leith has been quiet owing to the tempestuous weather outside detaining several large vessels due to arrive this month. At the monthly meeting of the Leith Dock Commission it was agreed to erect a new coal hoist on the north side of the Edinburgh dock in order to meet the demands of the increasing trade.

On the 17th inst., Mr. E. M'Hugh, secretary of the Dock Labourers' Union, addressed a largely attended meeting of labourers at Grangemouth, his remarks were loudly applauded; on the same day the crew of the s.s. *Carron* renounced the Union and sailed as usual.

The Stockbridge Cable Tramway permanent way has now been completed, and on the 10th inst. the cable was put in place and passed round the wheel in the engine-room, in Henderson Row, Edinburgh. Cars will shortly be run on this route, which should be very popular in the summer time as an easy exit from the city to the country.

At a meeting of the Executive Council of the Edinburgh International Exhibition, 1890, held on the 10th inst., it was agreed that in the event of it not being convenient for the distinguished personage who might perform the opening ceremony to attend on the 1st May, that the Exhibition should be opened to the public on that day leaving the formal ceremony to be performed afterwards as convenient. The treasurer reported that he has made satisfactory arrangements with the British Linen Company Bank for the financing of the Exhibition up to the date of the opening. Mr. Lee Bapty, the manager, is better pleased with the progress of the arrangements at this early stage than with any other Exhibition he has been connected with.

A change is about to take place in the management of one of the principal engineering firms here.

On January 23rd a meeting of the executive committee of the Edinburgh Exhibition Association was held at 27, Frederick Street, Edinburgh, Sir Thomas Clark presiding. The question of the applications for space was before the committee, and they resolved to recommend that considerable addition should be made to the buildings. It was proposed to erect a special annexe to hold the railway appliances which are being sent for exhibition by railway companies. It was agreed to have a fine art section and to build an annexe for the reception of works of art. It has been proposed to have a French *café*, in which the waiters, waitresses, and everything connected with it shall be French.

## OBITUARY.

**James Stewart.**—By a wide circle the death of Mr. James Stewart, of the well-known firm of iron-tube manufacturers, Coatbridge and Glasgow, will be deeply regretted. The sad event occurred on Sunday, 12th January, at his residence, 14, Windsor Terrace, Glasgow. For some months previous, the deceased gentleman had suffered from anæmia, and to this he succumbed whilst yet in the prime of life.

The firm of Andrew & James Stewart is one of the oldest and most important of the tube-manufacturing firms in the kingdom, and is from time to time entrusted with the execution of important orders by the government of our own and foreign countries, and by customers in every quarter of the globe.

The very constitution of the firm, as it at present stands, offers something of interest, and, in equally favourable circumstances, something that might be found worthy of more extensive imitation. The business was started in a very humble manner in 1861 by Mr. Andrew Stewart, who opened a modest little workshop in St. Enoch's Wynd, Glasgow, where he limited himself entirely to the manufacture of gas tubes. He soon found ample employment there for the hands with which he started, and encouraged by this success, naturally sought to develop his business by taking up another department. But his premises in St. Enoch's Wynd did not admit of any increase of the work carried on there; and the production of boiler tubes, to which he was now anxious to direct his attention, must be provided for elsewhere. Before the decade of 1861-71 was half run, Mr. Stewart having in the meantime assumed as partner his brother James (whose death has occasioned this notice), he cast about for a suitable site on which to make a fresh departure; and found it at Coatbridge. On the ground then selected a workshop was erected, which was the nucleus of the present extensive premises of the firm.

The four acres which were then secured have since expanded into three times that extent; and the modest little workshop into vast piles of buildings fitted with the most perfect appliances for carrying on the manufactures for which the firm is now famous.

In close proximity to the works, model dwellings for the workmen have been erected by the firm, and every acre of available ground around the original buildings has been acquired, in order to meet the increasing demand for room which the expansion of the firm's operations created.

More recently still, a foundry for the manufacture of cast-iron pipes was commenced at Firhill Road, Glasgow; and other important extensions are just now in progress.

Until 1882 the firm continued its business under the old designation, but in July of that year the concern was converted into a limited liability company, with a very extensive capital, held exclusively by the two gentlemen already named, and by seven of their managers and principal employés who had been associated with the firm for many years past. The company thus remained practically a private one, and apart from the severe loss occasioned by the death of the lamented partner, Mr. James Stewart, remains to-day the same as when formed.

Mr. James Stewart, who was the first Dean of Guild of the burgh of Coatbridge, and who at the time of his death was a Justice of the Peace for the county of Lanarkshire, a member of the School Board, and also held other public offices, was a man whose untiring zeal and industry made him surperior to all obstacles and established for him a most enviable character throughout his entire section of the country.

His was a round life; a complete manhood, part balancing part and producing a lovable symmetry.

But although holding many public offices, he was a man reticent in his acceptance of the same. Every office held by him was to a considerable extent thrust upon him. But it was this true modesty of character which adorned him, honoured him, and crowned his efforts with such pleasing success. It mingled as a sweet influence with all his public and private acts, gave majesty to him as an employer, dignity as an official, character as a citizen, and nobility as a man; and there are many in the district of Glasgow and Coatbridge, where chiefly he was known, and where so many of his generous deeds were performed, who will mourn his absence from their midst to-day.

But perhaps nowhere did his good qualities stand out so prominently as in the home circle. To bliss domestic his heart was fully given up, the comfort of his household, a watchfulness over the best interests of his children, occupied no small portion of his thoughts, and through his death his

**METEOROLOGICAL SOCIETY.**—The annual meeting of the Meteorological Society was held on January 15th, at the Institution of Engineers. Mr. Baldwin Latham, M. Inst. C.E., was resident for the ensuing year.

widow has to mourn the loss of a true, kind and affectionate husband; and his children that of a gentle and loving father, and in this respect, although deprived of him at the very zenith of his success in life, and at a time when worldly prosperity is smiling upon them, yet they have sustained a loss which no earthly good can compensate.

His age at the time of his death was 51; his remains were interred on Thursday, January 16th, in the Necropolis, the burial-ground adjoining the noble old cathedral, whither they were followed by a concourse of devout mourners.

He leaves a widow and five children with whom the most profound sympathy is expressed.

**Mr. Daniel Adamson.**—The subject of this sketch was born at Shildon, Durham, in 1818. He was a pupil of the celebrated Timothy Hackworth, who competed with Geo. Stephenson at the Rainhill locomotive trials. Mr. Adamson spent the period from 1835 to 1841 under Hackworth at the Shildon engine-works, of the Stockton and Darlington Railway. In 1848 he was appointed general manager of those works. In 1851 he commenced business on his own account at Newton-Wood and Newton-Moor iron works near Manchester. By 1871 he had so far outgrown his extensive premises at Hyde that he proceeded to build new and more commodious works at Dukinfield, but these had subsequently to be greatly enlarged to meet the expansion of his business. From these works he probably turned out more steam boilers than any other single manufacturer. Mr. Adamson will always be remembered as the pioneer in the introduction of the general use of Bessemer steel.

He largely contributed to the development of the North Lincolnshire iron-field, an iron making centre. He was also a shareholder in iron-works in South Wales and Cumberland, besides being connected with other important industrial enterprises.

In 1863 and 1864 Mr. Adamson set up the Yorkshire Iron and steel works at Penistone, which dealt entirely with Bessemer steel. These works were eventually purchased by Messrs. Charles Cammell & Co., Sheffield, and the sale was a very profitable one. These facts testify sufficiently to the commercial success that he achieved, though by the scientific engineer he is regarded rather as a man of great inventive skill and genius than as a wealthy manufacturer.

To the members of the Institution of Mechanical Engineers and those of the Iron and Steel Institute, Mr. Adamson has been a familiar figure for over forty years, but amongst the general public he only became widely known in 1882, when he advocated the construction of a ship canal from Liverpool to Manchester.

It was his enthusiasm and strong personality that worked on the people of Lancashire, and it was his dogged resolution and unflinching pertinacity that carried through the parliamentary business. On the subsequent floating of the company and remodelling of the board of directors Mr. Adamson retired. But though the credit of the carrying out of the canal is being earned by others, it was Mr. Adamson who brought it within the range of possibility, and bore alone the brunt of the early struggle. It would be impossible to exaggerate his popularity during the period of the parliamentary warfare. Every gain was applauded by his admirers, addresses were voted and bonfires were lit, while his appearance in the interested districts was hailed like the approach of a victorious general.

Mr. Adamson was a member of the Institution of Civil Engineers, a vice-president of the Institution of Mechanical Engineers, and past-president of the Iron and Steel Institute, having occupied the chair during 1887 and 1888. He was the recipient of the Bessemer medal in 1888. To the Iron and Steel Institute he contributed several papers, among which were the following:—"On quadruple-expansion engines." "On the mechanical and other properties of mild steel." "On a horizontal compound testing machine of 15,000 powers, and with further recording lever of 150,000 powers."

To attempt to do justice to the innumerable inventions he has made and improvements he has contributed to the resources of mechanical engineering would necessitate the writing of a history of that art.

Having been in the profession over half a century he appeared to belong to the period of the Stephensons, Brunel, and Fairbairn, and to stand apart with those mechanical giants. By the younger members of the society he was regarded with interest and respect. Whenever he spoke at meetings he was

sure of an attentive audience, for his vigorous delivery and earnest expression, his north-country shrewdness and thoughtful utterance charmed his hearers and reminded them in a manner of the elder Stephenson, whom he resembled in his intuitive genius as well as in his thoroughness. Though eminently practical, Mr. Adamson, like all the great engineers, was an ardent student of science. His speeches bristled with scientific illustration, and often revealed deep trains of thought, for his mind never rested satisfied with a practical result, but always striving after the why and wherefore. This perhaps has been the secret of his success in his case, as it undoubtedly has been in the case of so many others.

Mr. Adamson was one of the first to recognise the part that steel was destined to play in the arts of construction, and to discover the proper methods of manipulating it, and he was among the pioneers in the use of high-pressure steam in several successive cylinders.

In the manufacture of iron and steel boilers Mr. Adamson was a thorough believer in the superiority of steel. He used both Bessemer and open-hearth steel, and he also introduced the method of drilling the rivet holes in boiler plates *in situ*, instead of punching them as was formerly the practice.

It is only possible here to mention a few of his inventions.

In 1852 he patented the Adamson flanged seam for boiler flues. Later on he attempted the super-heating of steam between the cylinders in compound engines.

In 1857 he adopted the use of steel in locomotive boilers and other high-pressure boilers, of which he made nearly 3,000.

In 1858 he brought out hydraulic jacks and hydraulic rivetting. In this year also he took out the first patent in connection with his well-known testing machine.

In 1861-62 he built triple-expansion and quadruple-expansion engines for mill purposes.

In 1862 he commenced the practice of drilling the rivet holes in boiler plates.

In connection with the manufacture of steel he introduced many improvements.

Visitors to recent exhibitions, and especially to the Manchester Exhibition, will remember his excellent testing machine, and the quality of the workmanship in his wheellock engines.

He will be missed as one of the great pioneers in engineering acquainted with the practice for the last fifty years, and who was ever ready to advise and help those who needed his assistance.

Apart from works associated with his own name, it is known to the present writer that his advice was sought in connection with the application of steel in bridge-work on the large scale.

**Thomas Willson.**—It is with much regret that we have to announce the death of this gentleman at his residence, Stowage House, Deptford, on the 15th January, of congestion of the lungs.

The late Mr. Willson entered on his profession by serving an apprenticeship with the well-known firm of Messrs. Denny & Co., Dumbarton, and on the expiry of that apprenticeship he went to China and joined the firm of Messrs. Jardine, Mathieson & Co. He returned to this country in 1875 and joined the firm of Messrs. Amos & Smith, of Hull. While there he was in 1880 elected an engineer surveyor to Lloyd's Registry, and about two years after he was offered and accepted the position of managing engineer to the Wallsend Slipway Co., where he was so much liked by those under him that they, on his leaving, presented him with a piece of plate. On leaving the Wallsend Slipway Co., Mr. Willson received his appointment to the position of superintendent engineer of the General Steam Navigation Co.

He was of a retiring disposition, but at the same time well-known among his brother engineers, and his kindly advice was often of great service to young engineers. Among his intimates he was a fast friend, and a great favourite. He was long a member of the Institute of Naval Architects, and was a native of Scotland.

**BOARD OF TRADE ENGINEERS' EXAMINATION.**—At the examination of marine engineers held at North Shields, on the 14th, 15th, and 16th ult., Mr. William Cotton, of Middlesborough, successfully passed as extra first-class engineer. He was prepared by Mr. W. H. Thorn, 5, Waterville Terrace, North Shields, and is the twelfth successful pupil in this grade sent up from the above school.

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES—ENGLISH.

**Bona.**—On December 21st Messrs. Raylton, Dixon & Co. launched from their No. 2 Dockyard a steel screw steamer, which has been built for the English and American Shipping Co., London, of the following dimensions:—Length over all, 307 ft.; breadth, 40 ft.; depth, moulded, 21 ft. 4 in.; with a deadweight capacity of 3,660 tons. This vessel is built with raised quarter-deck, and has a long bridge extending beyond the foremast and connected with fore-castle, thus forming partial awning deck. Her engines will be supplied by Messrs. T. Richardson & Sons, Hartlepool, with cylinders 22 in., 35 in., and 59 in. by 39 in. stroke. She has been built under the superintendence of Captain Towill, inspector for her owners. On leaving the ways she was christened *Bona*.

**Morella.**—On December 21st Messrs. Robert Stephenson & Co., Limited, launched from their shipyard, at Hebburn, a large steel screw steamer, which they have built to the order of Messrs. W. H. Ross & Co., of Liverpool. The vessel has been constructed to the three-deck rule for scantlings, and the hull and machinery will take the highest class at Lloyd's. Her dimensions are:—Length, 350 ft.; breadth, 43 ft.; depth, 29 ft. 3 in.; and she will carry a deadweight cargo of over 5,000 tons. The topmasts are telescopic, to enable the ship to pass under the Manchester Canal bridges. She will be propelled by a set of triple-expansion engines of about 1,700 I.H.P.; these have been constructed at the engine works of Messrs. Robert Stephenson & Co., Limited, South Street, Newcastle. The vessel was named the *Morella*.

**Craigmore.**—On December 21st Messrs. Bartram & Haswell launched from their shipbuilding yard at Sunderland a large steel screw steamer, for Messrs. Wm. Johnston and Co., of Liverpool. The following are the principal dimensions:—Length, 284 ft.; breadth, 39 ft.; depth of hold, 18½ ft.; gross tonnage, 1,960 tons. She has been specially built for Messrs. Johnston's regular line of steamers between Liverpool and the Danube, and has been built under special survey to take the highest class in Lloyd's Registry. She is of the raised quarter-deck type, with bridge extending to foremast, and topgallant fore-castle for crew. The engines will be supplied by Mr. John Dickinson, the cylinders being 22 in., 36½ in., and 60 in., with 42 in. stroke. The boilers are of steel, and will work at 160 lb. pressure. The vessel was named the *Craigmore*.

**Llanberis.**—On December 21st a steel schooner-rigged steamer of 2,250 tons was launched at Sunderland, owned by Messrs. Evan Thomas, Ratcliffe & Co., Cardiff.

**Paranagua.**—On December 23rd Messrs. Raylton, Dixon & Co., 'Middlesbro', launched a fine steel screw steamer, which has been built for the Cie Chargeurs Reunis, of Havre and Paris. This vessel is of the following dimensions:—Length over all, 305 ft.; breadth, 38 ft.; depth moulded, 24 ft. 6 in.; is built on the spar deck rule to obtain the highest class of Veritas, and will be fitted throughout for accommodation of a large number of emigrants. Her engines are being built by Messrs. T. Richardson & Sons, Hartlepool, with cylinders 23 in., 37 in., and 61 in. by 42 in. stroke. On leaving the ways she was christened *Paranagua* by Mrs. Heran, the wife of M. Heran, who is superintending the vessel for her owner.

**Messapia.**—On December 23rd there was launched from the yard of the Sunderland Shipbuilding Co. a finely modelled passenger steamer, built to the order of the Puglia Steam Navigation Co., of Bari, Italy. The principal dimensions of the vessel are: Length, between perpendiculars, 275 ft.; breadth, extreme, 38 ft.; depth, moulded, 26 ft. 9 in. The vessel is built to take the largest class at Lloyd's upon the spar-deck grade, and has a long poop fitted with accommodation for about sixty first-class passengers. Topgallant fore-castle and bridge amidships, under which is accommodation for captain and officers. The vessel has three complete decks laid; the first 'tween decks are exceptionally high, and have sidelights all fore and aft, and is to be fitted with galvanized iron beds for large cooking ranges, doctor's shop, and all accessories for the convenience of a large number of passengers are provided. The deck machinery consists of direct steam windlass, 1 winches and steam steering gear, all by Messrs. James & Co.; large donkey boiler is fitted in casing, and is worked by the North Eastern Marine Engineer-

ing Co., Limited, Wallsend-on-Tyne, and are of the three crank triple-expansion type, having cylinders 23½ in., 39 in., and 64 in. diam. by 42 in. stroke; two large boilers working at a pressure of 160 lbs.; steam starting gear, and all details of a first-class engine are supplied. The hull and machinery have been built under the inspection of the Board of Trade, and will be supplied with their certificate for passengers. Upon leaving the ways the steamer was gracefully named *Messapia* by Lady Snagge, of Lake Como, Italy.

**Ville de Douai.**—On December 23rd there was launched from the Walker shipyard of Sir W. G. Armstrong, Mitchell & Co., a steel screw steamer named the *Ville de Douai*, specially constructed on Swan's patent principle for the carriage of crude petroleum in bulk. The vessel is capable of carrying 2,400 tons on a moderate draught of water. The machinery is being supplied by the Wallsend Slipway and Engineering Company, and is of the triple-expansion type.

**Ormesby.**—On December 23rd Messrs. Ropner & Son launched from their shipyard, at Stockton, a steel screw steamer, built to the order of Messrs. R. Ropner & Co. of West Hartlepool. Her dimensions are as follows, viz.:—Length, over all, 282 ft. 6 in.; breadth, 38 ft. 10 in.; depth, moulded, 21 ft. 11 in. She will take the highest class at Lloyd's, and is designed to carry 3,300 tons deadweight. She will be fitted with triple-expansion engines, by Messrs. Blair & Co., Limited, of 900 I.H.P., and two large steel boilers, working at 160 lb. She was named *Ormesby* by Miss Lillian Ropner, of Weston Hall.

**Oswin.**—On December 23rd Messrs. Turnbull & Sons launched from their premises at Whitby a new steamer constructed of steel. She has been built to the order of Messrs. Turnbull Brothers, Cardiff, and is of the following dimensions:—Length over all, 268 ft. 9 in.; length, between perpendiculars 258 ft.; breadth, 37 ft.; depth to top of cellular floor plate, 16 ft. 11 in. The new vessel is classed A1 at Lloyd's, and her estimated deadweight carrying capacity is 2,650 tons at 18 ft. She is fitted with Rodger's steam steering gear, and her engines, of 140 N.H.P., are by Messrs. Blair & Co., Stockton-on-Tees. The new vessel was named the *Oswin*.

**Parkfield.**—On December 23rd there was launched from the North Sands (Sunderland) shipbuilding yard of Messrs. Joseph L. Thompson & Sons a steel steamer of about 4,200 tons deadweight capacity. This vessel has been built to the order of the Steamship Parkfield Co., Limited, of Liverpool, per Messrs. Joseph Brown & Sons, managers, and is one of the raised quarter-deck type. The vessel is built under special survey for the 100 A1 class. The engines, which are of the triple-expansion type, are being built by Mr. John Dickinson, of Palmer's Hill Engine Works, having cylinders 23½ in., 38 in., 62 in. respectively with a stroke of 42 in. Two steel boilers, each of 160 lbs. pressure, will be fitted. The vessel was named the *Parkfield*.

**Eton.**—On December 24th the last launch of the year from the shipbuilding yard of Messrs. W. Gray & Co., Limited, was successfully accomplished, when the fine steel screw steamer *Eton* gilded safely into the water. The *Eton* has been built to the order of Christopher Furness, Esq., of this port, for Messrs. Galbraith, Pembroke & Co., of London. She is 310 ft. long over all, 41 ft. 6 in. beam, and 23 ft. 0½ in. deep, and will take Lloyd's highest class. She is constructed on the web-frame principle, with double bottom under each hold for water ballast, and has poop, raised quarter-deck, long bridge and topgallant fore-castle. The principal accommodation, including saloon, &c., is aft in the poop, while that for the engineers is close to the engine-room, and the crew's berths are in the fore part of the bridge. She is fitted with two donkey boilers, patent steam steering gear amidships, patent screw gear aft, patent direct steam windlass, powerful steam winches, and all the latest improvements for a first-class cargo steamer. She is under the large sheerlegs at the Central Marine Engine Works, off W. Gray & Co., Limited, receiving her machinery, consisting of fine triple-expansion engines and two large steel boilers. The ceremony of christening the *Eton* was gracefully performed by Mrs. McMoradie, of Greatham.

**Teresa.**—On December 24th a schooner-rigged steamer of 307 tons was launched at Sudbrook, owned by the executors of the late Mr. T. A. Walker, London.

**General Gordon.**—On December 24th Messrs. Cochran, Schofield & Cooper launched from their shipbuilding yard at

Grovehill, Beverley, a steam trawler, built to the order of Messrs. Pickering Haldane & Co., Limited, Hull. The vessel, which was named the *General Gordon*, is of the following dimensions:—Length, 105 ft.; breadth, 20 ft. 3 in.; depth of hold, 11 ft. She will be fitted by Messrs. C. D. Holmes & Co., of Hull, with 50 N.H.P. triple-expansion engines, and will be furnished with all the latest improvements for the North Sea trawling.

**Lyeemoon.**—On December 24th Messrs. Wigham, Richardson & Co. launched from their Neptune Yard, Low Walker, a steel screw steamer for the Chinesische Küstenfahrt Gesellschaft, of Hamburg, for their China coasting service. She is built to class 100 A1 at Lloyd's, on three-deck rule, under special survey, is fitted for first and second-class passengers, and has also separate accommodation for Chinese passengers. She is 305 ft. in length, 38 ft. in breadth, and 25 ft. in depth, and will carry nearly 2,000 tons deadweight. Her engines are also being constructed by the same builders, and are of their own type on the triplex-expansion principle (Tweedy's patent). The vessel was named the *Lyeemoon*.

**La Cambine.**—On December 24th there was launched from the Jarroo yard of the Messrs. Palmer's Co. a steel screw steamer. The vessel is of the following dimensions:—Length, 310 ft.; breadth, 39 ft.; depth, 27 ft. 6 in. The steamer, which is of the spar-deck type, is built to the highest class in the Veritas Registry, and is constructed and designed for carrying petroleum oil in bulk. She was named *La Cambine* by Mrs. Scheffer, of Newcastle.

**Amalia.**—On December 24th there was launched from the Howdon yard of Messrs. Palmer's Co. a steel screw steamer of the following dimensions:—Length, 299 ft.; breadth, 40 ft.; depth, 22 ft. She is rigged as a two-masted schooner, and is built to class 100 A1 at Lloyd's. She has a sunk poop and long raised quarter-deck aft, and accommodation for captain and officers and a few passengers is fitted in the sunk poop aft. The berths for the engineers are under the bridge amidships, and for the crew and firemen in the forecabin. All the decks are of iron, and there is fitted a cellular bottom for water ballast. Clark, Chapman's direct steam windlass will be fitted forward, and Muir and Caldwell's steam steering gear amidships. The vessel was built to the order of Ed. Vlasopoulos, of Ibrail, under the superintendence of J. Varnakiotte, of South Shields. The steamer on leaving the ways was named *Amalia* by Miss Remandos, assisted by Mrs. Raftopoulos.

**Staghound.**—On December 27th a steam vessel for long-line fishing was launched from the yard of Messrs. Cook, Welton, and Gemmell, shipbuilders, Hull, for the Humber Steam Trawling Co., Limited. She was named the *Staghound* by Mrs. M. Burton.

**Moldava.**—On December 28th Messrs. C. S. Swan & Hunter, of Wallsend, launched a steel screw steamer for the Mercantile Steamship Co., Limited, of London, for their general trade, this being the fifth steamer built by the firm for the same Co., all of which have been built under the superintendence of Mr. Terrot Glover, of Sunderland. The vessel is built to Lloyd's highest class on Messrs. C. S. Swan and Hunter's improved well deck type. Dimensions:—290 ft. over all, by 37 ft. 6 in. by 21 ft. 8 in. moulded. Engines will be fitted by Messrs. Blair & Co., Limited, Stockton, 22 in., 36 in., 59 in. diameter by 39 in. stroke. The vessel was named *Moldava* by Miss Hunter, of Wallsend.

**America.**—On December 28th Messrs. Raylton, Dixon & Co. launched from their Cleveland Dockyard a steel screw steamer named the *America*, which has been built by Messrs. S. M. Kuhnle & Son, Bergen, Norway, of the following dimensions:—Length over all, 204 ft.; breadth, 28 ft.; depth, moulded, 21 ft. 10 in., with a carrying capacity of 1,070 tons. This vessel, which is built to Lloyd's spar deck rule, to class 100 A1, is intended for the fruit trade from the West Indies to New York, and is specially fitted for the purpose with complete arrangements for insulating, ventilating and warming the holds, and she will also have handsome accommodation in houses on deck for passengers. Her engines are being built by Mr. John Dickinson, Sunderland, having cylinders 17½ in., 28 in., and 47 in. by 33 in. stroke, intended to give her a speed of 11½ knots.

**Skotland.**—On December 28th Messrs. Thomas and William Smith launched from their yard, at North Shields, a steel screw steamer of the following dimensions:—Length, 175 ft.; breadth,

28 ft.; and 13 ft. 6 in. depth in hold. She will be fitted with triple-expansion engines, supplied by Messrs. Ernest Scott & Co., Newcastle-on-Tyne; cylinders, 13½ in., 22½ in., and 36 in. by 27 in. stroke; boiler, 160 lbs. pressure. As the vessel left the ways she was named the *Skotland* by Captain Callases. The *Skotland* has been built to the order of Messrs. Fisher, Renwick & Co., Newcastle.

**Isle of Bardsey.**—On December 28th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a steel screw steamer of the following dimensions, viz., 230 by 33·6 by 17·10. The vessel is classed 100 A1 at Lloyd's under special survey, and is of the well-decked type, having poop, long raised quarter-deck and topgallant-forecastle. She is schooner-rigged and has been specially designed and fitted for the ore and general trades. She is fitted with triple-expansion engines, having cylinders of 18 in., 29 in., 48 in. diam. with 30-in. stroke, to work at a pressure of 160 lb. per square inch. The machinery and boiler have also been built by Messrs. John Readhead & Sons. The vessel was named the *Isle of Bardsey*, and has been built to the order of a firm in Liverpool, and will be managed under the limited liability system. The vessel will be commanded by Capt. Williams. Mr. Garnett, of Crewe, the company's superintendent, was present at the launch on behalf of the owners.

**Harewood.**—On December 31st there was launched from Palmer's Shipyard, Jarroo, a steel screw steamer of the following dimensions:—Length, between perpendiculars, 312 ft. 6 in.; breadth, 40 ft.; depth, moulded, 27 ft. 6 in. The vessel is built to class 100 A1 at Lloyd's, and is of the three-deck type. She is fitted with a poop bridge amidships, covering machinery space, and topgallant forecabin for the accommodation of captain, officers, and crew. The vessel is fitted with a double bottom for water ballast on the cellular principle; she will be rigged as a two-masted schooner, and fitted with all modern improvements. The steamer, which is constructed to carry 3,400 tons deadweight, was built to the order of Mr. William Wright, of South Shields. She was named *Harewood* by Miss Elsie Wright, youngest daughter of Mr. H. F. Wright, brother of the owner.

**Stanley Force.**—On January 1st a steel and iron schooner-rigged steamer was launched at Workington, owned by Stanley Force S.S. Co., Limited, (Messrs. W. S. Kennaugh & Co., Whitehaven).

**Croydon.**—On January 4th there was launched from the shipbuilding yard of Messrs. Wm. Harkess & Son, Middlesbrough, a steel screw steamer built to the order of Messrs. W. F. Connor & Co., of London, for their wine trade. The dimensions of the vessel are as follows:—Length, 230 ft.; breadth, 32 ft.; and 17 ft. 9 in. depth, moulded. She is classed 100 A1 at Lloyd's as a partial awning deck vessel, having raised quarter-deck aft, web frames in holds in place of hold beams, and cellular double bottom all fore and aft. Steam steering gear and three steam winches, patent windlass, and all latest improvements for the rapid loading and discharging of cargo. Her engines of 128 N.H.P. are by Messrs. Alexander, Shanks & Son, of Arbroath, having cylinders 17 in., 28 in., 47 in. by 33 in. stroke, with a boiler pressure of 160 lbs. On leaving the ways the vessel was gracefully named *Croydon* by Mrs. Bushell, of Newcastle-on-Tyne. The vessel has been superintended during construction by Mr. C. A. Bushell, of Messrs. Farina & Bushell, Newcastle-on-Tyne.

**Norse King.**—On January 7th a steel schooner-rigged steamer of 3,020 tons was launched at Sunderland; owned by W. Ross & Co., Liverpool.

**Robert Eggleton.**—On January 8th a steel schooner-rigged steamer was launched at Sunderland, owned by Mr. James Westoll, Sunderland.

**Lucy.**—On January 9th a well-built lighter of 130 tons burthen, was launched from Mr. Collinson's yard, Church-street, Hull. The lighter, on entering the water, was named the *Lucy*. The owners are Messrs. J. Grainger & Sons, Hull.

**Electric and Frolic.**—On January 11th Earles' Shipbuilding and Engineering Company, Limited, Hull, launched from their yard two new steam fishing vessels, *Electric* and *Frolic*, which they have constructed for the Grimsby Steam Fishing Company, Limited. These ships are 106 ft. 9 in. long by 20 ft. 6 in. beam by 11 ft. 6 in. depth, and are intended for deep-sea line fishings; they are exceptionally strong, being greatly in excess

of Lloyd's requirements for scantling for their 100 A class, and have provision in holds, in addition to the fish well, for the storage of fish, ice, &c. They will be fitted by the builders with triple-compound, three crank engines, having cylinders 12½ in., 20 in., and 32 in. respectively with a stroke of 22 in., and a powerful steel boiler made for a working pressure of 150 lbs. per square inch.

**Liberty.**—On January 13th there was launched from the yard of Earles' Shipbuilding Company, Limited, Hull, the steel screw s.s. *Liberty*, which they have built to the order of the Co-operative Wholesale Society, Limited, Manchester, for their special trade between Hamburg and Goole. She is classed 100 A1 at Lloyd's, of the following dimensions:—Length, 225 ft.; breadth, 33 ft.; depth of hold, 12 ft. 11 in.; and has a poop, bridge, and top gallant forecastle, accommodation being provided in the former in a substantial and handsome manner for captain, officers, and passengers, and for the crew in forecastle. There is ample water ballast and approved means for the rapid loading and discharging of cargo. She is schooner rigged with two polemasts, and has a good spread of fore and aft canvas. She will be propelled by a set of triple-expansion, three crank engines, having 24 in., 39 in., and 64 in. diameter by 33 in. stroke, and it is anticipated that these engines will drive the ship at a high rate of speed.

**Blenheim.**—On Monday, January 20th, Messrs. Edward Withy & Co. launched from their yard, at Hartlepool, a large steel screw steamer, built to the order of George Steel, Esq., of West Hartlepool, for Messrs. Steel, Young, & Co. of London. This is the 109th vessel in the builder's books, and the 31st built in the Hartlepool for the same owners; twenty-eight of these have been built by Messrs. Edward Withy & Co. She is a fine type of a modern cargo boat, measuring over 300 ft. in length, and built throughout of Siemens-Martin steel, with a large measurement and deadweight capacity, and built to the highest class at Lloyd's. The vessel has a long raised quarter-deck, short poop, long bridge-house, and a topgallant forecastle. The holds are fitted with iron-grain divisions and iron cargo battens; all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. In the main and after-holds the vessel is built on the web-frame system, which gives great strength, and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, two donkey boilers, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse-pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin providing accommodation for the captain, &c. is handsomely furnished in polished hardwood, with painted panels executed in a very elegant and effective style by the decorative staff of ladies employed by the firm. The steamer will be rigged as a two-masted fore and aft schooner, and has been constructed under the personal superintendence of George Steel, Esq. She will be fitted with triple-expansion engines, by Messrs. T. Richardson & Sons, Hartlepool. On leaving the ways the vessel was gracefully christened *Blenheim* by Miss Simpson.

**May Flower.**—On January 20th the training brig *May Flower*, of 500 tons, was successfully launched from Pembroke Dockyard. The christening ceremony was performed by Miss Howard, a granddaughter of the Earl of Cawdor.

**Strathdon.**—On January 21st there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer, which has been built to the order of Messrs. Burrell & Sons, of Glasgow. She is of the following dimensions, viz.:—Length, 300 ft.; breadth, 41 ft.; depth, 22 ft.; and is built under Lloyd's special survey to class 100 A1. This steamer has water ballast right fore and aft on the cellular system, and is fitted with all modern improvements for the rapid loading and discharging of cargo, including large donkey boiler and four double-cylindrical steam winches, and has direct acting steam windlass; steam steering gear, by Messrs. Muir & Caldwell, and Hastie's screw gear aft. The engines—which are to be supplied by Messrs. Wigham, Richardson—are of the triple-expansion type, having cylinders 18 in., and 62 in. by 42 in. stroke, with two large boilers at 160 lbs. pressure. On leaving the ways the vessel

was gracefully named the *Strathdon* by Mrs. W. J. Bone, of North Shields.

**Eugenie.**—On January 21st Messrs. Richardson, Duck & Co. launched from their yard an iron screw steamer of the following dimensions, viz.:—Length, over all, 280 ft. 3 in.; breadth, extreme, 36 ft. 6 in.; depth, moulded, 19 ft. 1½ in. This steamer, which has been built to the order of Messrs. Burdick & Cook, of London, is classed 100 A1 at Lloyd's, and has been built under special survey. She has a short break poop, raised quarter-deck, long bridge from after-end of engine-room to foremast, and a topgallant forecastle; also a cellular double bottom fore and aft for water ballast. She will be schooner rigged. Her engines, by Messrs. Blair & Co., Limited, have cylinders 21½ in., 35 in., and 57 in. by 36 in. stroke. As the vessel was leaving the ways she was gracefully christened the *Eugenie* by Miss Ida Cocqueral, of London.

**Bendi.**—On January 21st Messrs. Schlesinger, Davis & Co. launched from their shipbuilding yard, Wallsend-on-Tyne, a large steel screw steamer, named the *Bendi*, built to the order of Mr. Jos. Hault, of Liverpool, the managing owner of the Ben Line of steamers of that port. The vessel is of the following dimensions:—Length, between perpendiculars, 345 ft.; breadth, moulded, 42 ft. 11 in.; depth, moulded, 24 ft. 1 in.; and is designed to carry a deadweight cargo of about 5,100 tons. She is constructed on the cellular bottom principle throughout for water ballast, and has a poop, long raised quarter-deck, long bridge extending beyond foremast, and a topgallant forecastle. Shifting boards and trimming hatches will be fitted to each hold in order to comply with the Grain Cargoes Act. She will be rigged as a two-masted fore-and-aft schooner. Maginnes's patent steering gear will be fitted in the engine-room, with shafting running along the deck, acting direct on the quadrant, thus dispensing with all chains, rods, sheaves, &c. Messrs. Clarke, Chapman & Co.'s patent steam windlass will be fitted on the forecastle. The vessel will also be fitted with five powerful steam winches for the rapid loading and discharging of cargo, special arrangements being made on deck for the stowing of all cargo gear. The accommodation for the captain, officers, and engineers is amidships in houses on the top of the bridge deck, the forecastle being fitted up in a substantial manner for the crew. The *Bendi* classed 100 A1 steel at Lloyd's, and has been built under special survey. The engines of the triple-expansion description, are of about 1,500 I.H.P., having cylinders 25 in., 42 in., and 64 in., by 45 in. length of stroke. The boilers are of steel, two in number, working at a pressure of 160 lbs. per square inch. The machinery has been constructed by the North Eastern Marine Engineering Co., Wallsend-on-Tyne, and, together with the hull, has been erected under the superintendence of Mr. A. C. Hay, of Liverpool, the owner's superintendent. The vessel was named the *Bendi* by Miss Burge, of Newcastle-upon-Tyne.

**Umbilo.**—On January 21st Messrs. W. Gray & Co., Limited, launched a handsomely modelled screw steamer of the following dimensions, viz.:—Length, over all, 280 ft.; breadth, 37 ft. 6 in.; and depth, 24 ft.; built to the order of Messrs. Bullard & King, of London, for their line of steamers between that port and Natal. The vessel takes Lloyd's highest class, is built of Siemens-Martin mild steel, and is of the spar-deck type with short poop, and long deck-house for passengers, having well lighted berths, and the saloon tastefully finished with inlaid panels. The state-rooms will have patent fold-up washstands. The officers' rooms are amid-ships and the crew's berths forward. A deep ballast tank is fitted amidships, and large trimming tanks forward and aft. All the usual first class working appliances will be provided, including patent stockless anchors, stowing into hawse pipes, patent windlass, patent donkey boiler, two steam winches at each of the principal hatchways, double derricks, patent steam and hand steering gear amidships, screw gear aft, two polemasts with smart fore and aft rig, boats on beams overhead, &c. The Central Marine Engine Works of Messrs. W. Gray & Co., Limited, supply the engines, which are of the triple-expansion type of over 1000 I.H.P., and two large steel boilers to work at 150 lbs. pressure per square inch. The hull and machinery have been built under the superintendence of Mr. J. Matthews on behalf of the owners. The ceremony of christening the ship *Umbilo* was gracefully performed by Miss Smith, of West Hartlepool.

**Naparina.**—On January 22nd the Edwards' Shipbuilding Co., Howdon-on-Tyne, launched the steel screw steamer *Naparina*, the latest addition to Messrs. Caw, Prentice, Clapperton & Co.'s direct line of steamers from Glasgow to the West Indies. The principal dimensions are:—Length, 270 ft.; breadth, 36 ft.; and depth, 19 ft. 3 in. Triple-expansion engines, made by the North-Eastern Marine Engineering Co., Wallsend, will be fitted.

**Steel Screw Steamer.**—On January 22nd there was launched from the yard of Messrs. William Doxford & Sons, at Pallion, a large steel screw steamer, built to the order of Messrs. Beyts, Craig & Co., of London and Bombay, for the Bombay London Steamship Co., Limited. She has been expressly designed for the Bombay trade, and is of the following dimensions:—Length, 365 ft.; extreme breadth, 44 ft.; depth, moulded, 30 ft., with a deadweight capacity of 5,600 tons, on the small draught of 22 ft. 6 in.

**Relay.**—On Thursday afternoon, January 23rd, there was successfully launched from the yard of Messrs. R. Thompson & Sons, Southwick, a steel twin-screw steamer, designed for the laying-down and picking-up of submarine cables, built to the order of J. R. France, Esq., 11, Queen Victoria Street, London, destined for the service on the cables of the Central and South American Telegraph Co., New York. Her dimensions are:—Length, 240 ft.; breadth, 32 ft. 2 in.; depth of hold to Lloyd's ordinary floors, 24 ft. She is classed 100 A1, special survey, awning decked, and built on the cellular-bottom principle, divided into fore and aft and thwartship divisions, so that she can be readily trimmed when laying cable. There are also three tanks for holding the cable, besides the usual appliances of merchant ships. On the bow and stern are large sheaves for paying and hauling in the cables, the forward sheaves being built into the bow, finishing on a line with awning deck and stern, thus forming a very graceful cutwater. On the main deck there will be fitted a combined picking-up and paying-out machine by Messrs. Johnson & Phillips, London, driven by a pair of powerful independent engines. On this deck also are the saloon cabins for officers, engineers, electricians, and cable hands. The saloon is neatly arranged and fitted up in mahogany, rosewood, and Hungarian ash, with electroplate fittings, electric light, and pneumatic bells throughout. The main deck is made of iron, and covered with pitch pine in way of cabins, the awning deck being of teak. The vessel is fitted with two steam winches, large multitubular donkey boiler, steam steering gear, steam windlass, and steam winding machine, and all the latest improvements. The boats are fitted with patent disengaging gear and patent sheaves for paying-out and taking-in cables. The engines are twin-screw, and have been constructed by Messrs. G. Clark, Limited, Southwick. They are of 180 N.H.P., and passed by the Board of Trade. The vessel being very finely modelled, a high rate of speed will be attained. During the construction the steamer and engines have been under the inspection of Mr. D. Rosser, of Cardiff. As the vessel left the ways she was gracefully christened the *Relay* by Miss Marsh, of London.

#### LAUNCHES.—SCOTCH.

**Sard.**—On December 20th there was launched from the shipbuilding yard of Messrs. Scott & Co., Bowling, a screw steamer of the following dimensions: Length, 165 ft.; breadth, 26 ft.; depth, 12 ft. 2 in.; built to the order of Mr. William Robertson, 88, Great Clyde Street, Glasgow, and intended for his general coasting trade. Triple-expansion engines will be supplied by Messrs. Muir and Houston, Portman Street, Kinning Park, Glasgow. The vessel was named the *Sard* by Miss Catherine Cullen, Rowanlea.

**Weimer.**—On December 21st there was launched from Messrs. Ramage and Ferguson's shipyard, at Leith, a steel screw passenger steamer, named the *Weimer*, built to the order of Messrs. James Currie & Co., shipowners, Leith, for their Hamburg and Leith passenger service. The principal dimensions being:—Length, K. and F., 254 ft.; breadth, 34 ft.; depth, moulded, 25 ft. She has to be fitted with accommodation for 56 first-class passengers, 16 second-class, and 170 steerage passengers. The engines, which are also supplied by the builders, are triple-expansion with cylinders 23 in., 37 in., and 60 in. diameter, and 42 in. stroke, supplied with steam from two large single-ended steel boilers. The *Weimer* on leaving the ways was named by Miss Elsa Currie, Trinity College, Edinburgh.

**Jarnac.**—On December 21st Messrs. S. & H. Morton & Co., of Leith, launched a steel screw steamer, named the *Jarnac*, built to the order of Messrs. T. & J. Harrison, of Liverpool, and intended specially for the wine trade between that port and France. The dimensions are:—Length, 185 ft.; breadth, 28 ft.; depth, 14 ft. 6 in. The steamer will have a carrying capacity of about 800 tons deadweight.

**Singan.**—On December 21st Messrs. Scott & Co., shipbuilders, Greenock, launched from their Cartadyke yard a steel screw steamer of the following dimensions:—Length, 255 ft.; breadth, 36 ft.; and depth, 22 ft. 6 in.; and 1,700 tons net register, for the China Navigation Co. Limited. The vessel was named *Singan* by Miss Frances Scott. The *Singan* will be supplied with engines of 1,800 I.H.P. by Messrs. Scott & Co.

**Heron.**—On December 21st a steamer named the *Heron*, built by Messrs. Gourlay Brothers & Co. for the General Steam Navigation Co., London, was launched from Camperdown Shipyard, Dundee. The *Heron*, which has been built to the highest class of Lloyd's, is of iron. Her gross tonnage is 890, her carrying capacity being about 1,150 tons. She is 233 ft. in length, 33 ft. beam, and 15 ft. 10 in. depth, moulded. She is rigged as a fore-and-aft schooner, has got water ballast tanks in the fore and after holds, and is provided with a long poop and forecastle. The captain and officers are accommodated under the poop aft, where there are also a few spare state rooms for passengers. The engineers are located amidships, and the sailors and firemen in the forecastle. Four steam cranes are erected for loading and unloading cargo, and there is a steam windlass to assist in working the vessel. Triple-expansion engines were fitted on board while the vessel was on the stocks, and, as steam had been got up, a trial trip was made down the river immediately after the launch, when the machinery was found to work smoothly. The *Heron* is the largest vessel which has been launched with steam up at Dundee. The naming ceremony was performed by Miss Rachel E. White.

**Mexico.**—On December 23rd the Grangemouth Dockyard Co. launched from their shipbuilding yard at Grangemouth a steel-screw steamer called the *Mexico*, which has been built to the order of Messrs. Romano & Abaunza, of Tobacco, for their passenger and cargo trade in the Gulf of Mexico. The dimensions are as follows:—178 by 25 by 11 ft. 6 in. to main deck. The engines are being supplied by Messrs. Dunsinuir and Jackson, of Govan Engine Works, Glasgow. They are of the triple-expansion type, cylinders 16 in., 26 in., and 40 by 30 in. stroke, supplied with steam by a large steel boiler, working at 160 lb. pressure, and capable of driving the vessel at a speed of 11 knots.

**Abbotshall.**—On December 23rd there was launched from the shipbuilding yard of Messrs. John Scott & Co., Kinghorn, a screw steamer, built to the order of the Kirkcaldy and London Steam Shipping Company. The vessel, which is built of steel throughout, is of the following dimensions:—Length, 165 ft.; breadth, 25 ft.; depth, 12½ ft.; and is intended to trade between Kirkcaldy and London. She is fitted up with compound surface-condensing engines, and is expected to attain a high rate of speed. She was named the *Abbotshall*.

**North City.**—On December 23rd a new steam trawler was launched from the shipbuilding yard of Messrs. John Duthie, Sons & Co. She was named the *North City*, and has been built to the order of Mr. William Pyper. Her dimensions are as follows:—Length, 103 ft.; breadth, 20 ft.; depth, 10 ft. 3 in.; gross registered tonnage, 120; 50 N.H.P.

**Egret.**—On December 23rd there was launched from Messrs. W. B. Thompson & Co.'s Caledon shipyard, Dundee, a steel screw steamer, named the *Egret*, for the Cork Steamship Co., Limited. The following are the vessel's dimensions:—Length, between perpendiculars, 256 ft.; breadth, moulded, 32 ft.; depth of hold, 15 ft. 8 in. She has been built in excess of the highest class at Lloyd's, and is intended for the Cork Company's general trade. The engines, which are of the triple-expansion type, have cylinders 21 in., 34 in., and 55 in. diameter, with 42 in. stroke. Steam is supplied from two steel boilers at a pressure of 160 lbs.

**Baron Fyfe.**—On December 26th Messrs. Robert Duncan & Co. launched from their shipbuilding yard, at Port-Glasgow, a spar-decked steel screw steamer of the following dimensions:—Length, 230 ft.; breadth, 33 ft.; depth, 20 ft. 8 in.; gross tonnage, 1,328 tons. The new vessel, which was named the

**Baron Fyfe**, has been built to the order of Mr. Hugh Hogarth, of Ardrossan. She will be fitted with triple-expansion engines by Messrs. Duncan Stewart & Co., of Glasgow.

**Arethusa**.—On December 27th a steel sailing ship of 1,720 tons was launched at Glasgow, owned by B. Wencke & Son, Hamburg.

**Nautilus**.—On January 7th a steel schooner-rigged steamer of about 358 tons was launched at Paisley, owned by Messrs. Webster & Co., Cape Town.

**Roseneath**.—On January 8th there was launched from the shipbuilding yard of Messrs. Murdoch & Murray, Port-Glasgow, for Messrs. P. H. Dixon & Harrison, Glasgow, a large steel screw steamer, 260 ft. by 37 ft. by 19 ft. 6 in., moulded; dead-weight capacity on Lloyd's freeboard, 2,650 tons; classed 100 A1 at Lloyd's under special survey. She was named *Roseneath*. After the launch the steamer was taken in tow for Glasgow, where the machinery—consisting of triple-expansion engines, cylinders 19 in., 33 in., and 52 in. by 39 in. stroke; two boilers, four steam winches, and donkey boiler—will be put on board by Mr. William Kemp, Govan.

**Wistow Hall**.—On January 8th the first launch at Greenock this year took place from the shipbuilding yard of Messrs. Caird & Co., the vessel being the steel screw steamer *Wistow Hall*, built to the order of the Sun Shipping Co., of Liverpool. Her dimensions are:—Length, 350 ft.; breadth, 42 ft.; and depth, 29 ft. 9 in. and of 3,200 tons gross. She has been built under special survey, is classed 100 A1 at Lloyd's, and is intended for the general cargo trade. She will be supplied by the builders with triple-expansion engines of about 2,000 I.H.P.

**Kweiyang**.—On January 8th a steel schooner-rigged steamer, of 1,620 tons, was launched at Glasgow, owned by the China Navigation Co., London.

**Persis**.—On January 9th an unfortunate accident occurred at the launch of the *Persis* from the shipbuilding yard of Messrs. Mackie & Thomson, Govan. When the vessel entered the water and her checking gear began to act both chains broke, and the vessel, with nothing to hold her, ran into Messrs. Henderson's Wharf, on the west side of the Kelvin, doing considerable damage. The vessel was afterwards towed up the river and berthed at Kingston Dock. The *Persis* is a steel screw steamer of 1,900 tons gross, built to the order of Messrs. Aitken and Walker, Glasgow, and intended for their general trade. Her dimensions are:—Length, 260 ft.; breadth, 37 ft. 6 in.; depth, 24 ft. 9 in. She is classed 100 A1 at Lloyd's, and has been built in excess of their scantlings. She will be fitted by Messrs. Muir & Houston with triple-expansion engines of 900 I.H.P., with cylinders of 18 in, 29½ in, and 47 in. diameter by 39 in. stroke.

**Rasmara**.—On January 9th Messrs. A. & J. Inglis, Point-house, Glasgow, launched a steel paddle steamer named *Rasmara*, which has been built to the order of the British India Steam Navigation Company, for trading between Calcutta and Rangoon. The vessel is of the following dimensions:—Length, 256 ft.; breadth, 31 ft.; depth, 13 ft. 6 in., with a gross tonnage of about 900. The steamer will be fitted by the builders with triple-expansion engines. The engines are of the diagonal type, with cylinders 29 in., 47 in., and 70 in. in diameter respectively, with a piston stroke of 6 ft. 6 in. Steam is supplied from two double-ended boilers of steel, working to a pressure of 160 lb. to the square inch.

**Asuncion**.—On January 11th Messrs. Robert Duncan and Co. launched a steel twin-screw steam named the *Asuncion*, of 450 tons gross register. Dimensions:—Length, 160 ft.; breadth, 33 ft.; depth, 9 ft. She was built to the order of Messrs. Morton & Williamson, Glasgow, and will be supplied with triple-expansion engines by Messrs. Rankin & Blackmore, Greenock.

**Glencona**.—On January 11th a steel barque, of about 2,470 tons, was launched at Port-Glasgow, owned by Messrs. W. O. Taylor & Co., Dundee.

**Edith**.—On January 21st there was launched from the shipyard of the Grangemouth Dockyard Co., at a steel screw steamer named the *Edith*, of 1,200 tons. She is of the latest type, with black and long extended bridge and topgallant

forecastle, and fitted with all the latest improvements, including Clark, Chapman's steam winches, Alley & M'Lellan's Sentinel steam steering gear, McOnie's patent steam windlass. The engines are supplied by Messrs. Alley & M'Lellan, Polmadie Engine Works, Glasgow, cylinders 19 in., 30 in., and 51 in. by 39 in. stroke; steam 160 lbs. pressure, from two boilers 12½ ft. by 10 ft. The steamer, which is intended for the general carrying trade, has been built to the order of Messrs. Robinson Brothers, of Whitby and London, and makes the ninth vessel owned by that firm. Captain Barrows, ship's-husband for the owners, superintended the construction of the vessel.

**Illovo**.—On January 21st this vessel, built to the order of Messrs. J. T. Rennie, Son & Co., of London and Aberdeen, was launched from the yard of Messrs. Hall, Russell & Co., Aberdeen. Her dimensions are as follows:—Length, 270 ft. 4 in.; breadth, 35 ft. 2 in.; and depth, 20 ft. 6 in. She is built on the spar-deck rule, and will be fitted with triple-expansion engines of 250 H.P., also of Messrs. Hall, Russell's manufacture, with cylinders 34 in. and 56 in. and 42 in. stroke and two steel boilers with a working pressure of 160 lbs. per square inch. She will also be fitted throughout with electric light by Messrs. Norman & Sons, Limited, Glasgow. This vessel is the fourth of the same design built for Messrs. Rennie under the superintendence of Messrs. Flannery, Baggally & Johnson, of London and Liverpool, and is sister ship to the *Matabel*, whose engines made the longest run on record without stopping, namely, over 6,000 miles.

**Bremerhaven**.—On January 22nd Messrs. Russell & Co. launched from their Greenock yard a large steel steamer, built for the petroleum bulk carrying trade. The vessel is of the following dimensions:—Length, 340 ft.; beam, 42 ft. 8 in.; depth, moulded, 27 ft. 3 in., and is built to the highest class both at Lloyd's and the Bureau Veritas, and, in addition, has the distinctive mark given by the latter society to vessels which are practically unsinkable. The vessel is divided into eight oil-tight compartments, all of which have been separately tested by great pressure previous to launching, which tests they stood remarkably well. In addition to these there are safety spaces at each end of the oil tanks to completely isolate the oil from the rest of the vessel. She has been built from the plans and specifications of Flannery & Blakiston, of Liverpool and London, who also superintended her construction and her machinery, and is the fourth vessel designed by Messrs. Flannery for Messrs. Hermann, Stursberg & Co., of New York, for their trade between America and the Continent. As the vessel will carry close upon 4,000 tons of oil, she is one of the largest, if not the largest, petroleum steamer yet built. She will be fitted with triple-expansion engines by Messrs. Duncan, Stewart & Co., of Glasgow, having cylinders 25 in., 40 in., and 66 in. by 42 in. stroke, with extra large double-ended boilers, and she will be capable of maintaining a speed at sea of ten knots at least. The representatives of the owners in this country are Messrs. R. W. Leyland & Co., of Liverpool, and the vessel will be under the command of Captain Schmidt.

**Fascadale**.—On January 23rd a beautiful four-masted sailing ship, built for Messrs. J. & A. Roxburgh, of Glasgow, was launched at Linthouse by Messrs. Alex. Stephen & Sons. The vessel is of about 2,100 tons gross, and 100 A1 at Lloyd's, with extras beyond the requirements for classification. The accommodation for captain, officers, and crew is excellent; and, besides a thorough outfit of the best usual appliances for working a sailing ship, she is fitted with a boiler and strand windlass in forward deckhouse, for loading and discharging, driving windlass, pumps, &c. She is sister ship to the *Carradale*, recently launched by the Messrs. Stephens for the same owners; and as she left the ways she was gracefully named the *Fascadale* by Miss Strong, 17, Westbourne Gardens. The *Fascadale* is to load in Liverpool for Melbourne, and will be commanded by Captain John H. Stiven, late of the *Arethusa*, of Liverpool.

**Iron Steamer**.—On January 23rd Messrs. John Fullerton & Co. launched from Morksworth Building Yard, Paisley, an iron screw steamer of 200 tons gross, built to the order of the Newry and Kilkeel Steamship Co., Limited, Newry, and intended for the coasting trade. Compound engines of 45 N.H.P. will be supplied by Mr. William Kemp, Helen Street, Govan.

**Princess Victoria**.—On January 23rd, Messrs. William Denny & Bros., Dumbarton, launched a paddle-steamer for the Port-Patrick and Wigtownshire Railways (Joint Committee), for their services between Larne and Stran. The ceremony

of naming the steamer *Princess Victoria* was performed by Miss MacInnes, daughter of Mr. Miles MacInnes, M.P. for Hexham Division of Northumberland. There were also present:—Mr. MacInnes, who is a director of the London and North-Western Co.; Mr. W. W. Thompson, chairman of the Midland Co.; Mr. Brown, director of the Caledonian Co.; Mr. Nicholson and the Earl of Galloway, directors, and Mr. Morton, manager of the Glasgow and South-Western Co.; Mr. John Thomson, of Carlisle, the secretary of the Joint Committee; Mr. Cumming, of Stranraer, manager; Mr. Jardine, accountant; Captain Campbell, of Stranraer and Larne service; and other ladies and gentlemen. This steamer is of the following moulded dimensions:—280 ft. by 35 ft. 6 in. by 14 ft., with long poop, bridge, and forecastle, which together cover almost the entire main deck, forming a splendid promenade for passengers. Contrary to the usual practice in paddle steamers, the first-class accommodation is amidships, immediately forward of the machinery. On the upper deck between the two funnels accommodation is provided for four private cabins and a large ladies' deck cabin very similar in character and design to those fitted on the English Channel steamers. Forward there is ample accommodation underneath the forecastle for deck passengers, and the remainder of the ship is given up for cargo and cattle carrying. The arrangements for the cattle are such that when on board passengers need not know the vessel is carrying cattle at all. The machinery is being constructed by Messrs. Denny & Co., and consists of a pair of compound surface condensing diagonal engines, steam being supplied from four steel tubular boilers, two at each end of the engine space, and forced draught on the closed stokehole principle is applied. The distance between Larne and Stranraer—the shortest sea passage from Ireland to Scotland—is thirty-five knots, and the steamer is designed to perform the journey in, at most, two hours.

**Francisco Vidiella.**—On January 24th Messrs. David J. Dunlop & Co. launched from Inch Work, Port-Glasgow, the s.s. *Francisco Vidiella*, which they have built to the order of Messrs. Vincente, Martinez & Co., of Monte Video. The dimensions of the steamer are:—Length, 162 ft.; beam, 28½ ft.; depth of hold, 10 ft.; and the service for which she is intended is for river and coast traffic. The principal object considered in her design and construction being to obtain a large carrying capacity on light draft of water with a good service speed on a small consumption of fuel. For working cargo two powerful steam cranes will be fitted to the vessel, besides Clark Chapman's steam windlass, Alley & MacLellan's steam steering gear, and all the complete and necessary outfit for a cargo steamer of her class. A limited accommodation is provided in a full poop. The engines, which are of the three cylinder type, are of the builders' own make, with large boiler power for service in tropical waters. The indicated horse-power will be about 500, with which the vessel is expected to attain a speed of ten knots. After the launch the new vessel was berthed alongside the builders' wharf, where the engines and boilers will be put on board and the vessel made ready for sea.

#### LAUNCHES.—IRISH.

**Nizam.**—On December 21st a fine screw steamer, named the *Nizam*, was launched from the shipbuilding yard of Messrs. Harland & Wolff, Belfast. She is a sister ship to the *Nawab* and *Nadir*, built by the same firm some time ago, and has been constructed for the Asiatic Steam Navigation Co., Liverpool. The vessel is intended for the East India trade. Her dimensions are:—Length, 345 ft.; breadth, 42 ft.; and gross tonnage, 2,970 tons. The *Nizam* will be fitted with triple-expansion engines of the most improved type.

**Gaekwar.**—On December 23rd Messrs. Harland and Wolff launched from their shipbuilding yard on the Queen's Island, Belfast, a new screw steamer named the *Gaekwar*. The vessel, which has been built to the order of Messrs. Thomas and John Brocklebank, Liverpool, is 400 ft. in length and 45 ft. in breadth. Her gross tonnage is 4,014, and she will be supplied with triple-expansion engines of 1,600 H.P. She is intended for the East Indian trade.

**County Down.**—On December 23rd there was launched from the shipbuilding yard of Messrs. Worteman, Clark & Co., Belfast, a steel screw steamer, built to the order of the County Steamship Co., Limited, of Belfast, of which Messrs. W. J. Woodside & Co. are managers. The vessel is of the well-deck type, and of large tonnage.

**Nuestra Senora del Carmen.**—On January 18th an iron schooner-rigged steamer, of 254 tons, was launched at Belfast, owned by Zolio Ibanez de Aldecoa, Manila.

#### LAUNCH.—NORWAY.

**Antonio Zambrano.**—On January 9th the new steamer *Antonio Zambrano* was launched from Aker's Engineering Company, Norway. Length, 172½ ft.; breadth, 26 ft.; height, 13½ ft.; size, about 650 tons. It belongs to a syndicate in Christiania, and is intended to trade between the West Indies and North America.

#### TRIAL TRIPS.

**Sir Walter Raleigh.**—On December 18th the steamer *Sir Walter Raleigh*, of Plymouth, built by Messrs. Craig, Taylor & Co., Stockton, to the order of Messrs. R. B. Triplett & Co., of Plymouth, was taken on her official trip from the Tyne. Her length is 270 ft.; breadth, 37 ft.; depth, 19 ft. 8 in.; tonnage, 1,985. She has engines 170 H.P., cylinders 20 in., 33 in., and 54 in. high pressure, triple-expansion, with 36 in. stroke, at a working pressure of 160 lbs. The engines were built by Mr. Middleton Pratt, of Huddersfield, and sent by rail in pieces to J. T. Eltringham, Stone Quay Yard, South Shields, and fitted on board. The vessel, after running the measured distance, obtained a speed of 11½ knots, which was considered satisfactory. On her return she proceeded to Hebburn to load for Genoa.

**Tordenskjold.**—On December 17th the steamer *Tordenskjold*, recently launched by Messrs. Thomas and William Smith, of North Shields, for Wilh. Wilhelmsen Co., Tonsberg, proceeded to sea, loaded with 1,725 tons coal, to complete the adjustment of compasses and trial of engines. The vessel is 225 ft. by 32 ft. 6 in. by 15 ft. 9 in., built of steel; engines 16½ in., 22 in., 44 in. by 33 in. stroke; boiler 160 lbs. pressure, by the North Eastern Marine Engineering Co., Limited, Wallsend. The machinery worked most satisfactorily, and the vessel steamed upwards of nine knots per hour. Mr. Geo. Noble, of Messrs. Noble and Buckle, represented the owners. The vessel afterwards proceeded on her voyage to Leghorn under the command of Captain Zachariassen.

**Boldon.**—On December 17th the new screw steamer *Boldon* left the Tyne for a trial trip fully laden. This vessel, which has been built by Messrs. Wood, Skinner & Co., Bill Quay, to an order of Messrs. Swanson & Sons, Newcastle, is an exceedingly fine specimen of cargo steamer, and is of the following dimensions, viz.:—Length, 237 ft.; breadth, 33 ft.; draught, 16 ft.; and is fitted with all the latest and most modern appliances. The machinery, which is of the triple-expansion type, has been built by the North Eastern Marine Engineering Co., Limited, Wallsend, and is fitted with all the latest improvements. Throughout the trial the engines ran with perfect smoothness, and without any hitch whatever, giving every satisfaction. The ship, after the trial, proceeded on her maiden voyage to London.

**May.**—On December 18th the new screw steamer *May* left the Wear for her trial trip. The vessel, which has been built by Messrs. John Priestman & Co., Sunderland, for Mr. George Hopkins, Cardiff, is a cargo steamer of the following dimensions:—Length, 238 ft.; breadth, 32 ft. 6 in.; depth moulded, 16 ft. 7 in. The machinery has cylinders 17 in., 28 in., and 46 in. with 33 in. stroke, and has been built by Messrs. William Allan & Co., Scotia Engine Works, Sunderland. During the trial the engines worked without a hitch of any kind, and the ship attained a mean speed of about 10 knots, which was considered very satisfactory.

**Tunbridge.**—On December 21st the s.s. *Tunbridge* proceeded from the Tees on her trial trip. This vessel has been built by Messrs. Raylton, Dixon, & Co., of Middlesbrough, to the order of Messrs. Temperley & Co., of Newcastle and London, for Temperley Steam Shipping Co., and is of the following dimensions: Length over all, 307 ft.; breadth, 40 ft.; depth, moulded, 21 ft. 4 in.; with a deadweight capacity of 3,600 tons. She is built on raised quarter deck rule, but with well filled in, is classed as a partial awning deck boat by Lloyd's. Her engines, which have been fitted by Messrs. T. Richardson & Sons, Hartlepool, of 190 N.H.P., have cylinders 22 in., 35 in., and 59 in. by 39 in., and on her run from the Tees to Blyth gave

every satisfaction. She has been built under the superintendence of Mr. Wm. White, of Newcastle, and is commanded by Captain Johnson.

**Itaparica.**—On December 21st the *Itaparica*, a steel screw steamer, of 2,100 tons burthen, built at the Walker shipyard of Sir W. G. Armstrong, Mitchell, & Co., to the order of the Hamburg South American Steam Navigation Co., was taken to sea for her official trial trip. After adjusting compasses a trial was made over the measured mile, when a mean speed of 13 knots was registered, the machinery working without a hitch.

**Langosta.**—On December 21st the screw steamer *Langosta*, built and engined by Messrs. Blackwood & Gordon, Port-Glasgow, for Messrs. James and Alex. Allan, Glasgow, went down the Firth on her official trial trip with satisfactory results. The steamer is a sister ship to the *Mariposa*, which left a month ago for the River Plate, and she proceeds to the same destination, under command of Captain Wallace. Both steamers are fitted with triple-expansion engines.

**Eon.**—On December 21st the new steel steamer *Eon*, just completed by Messrs. Ropner & Son, Stockton-on-Tees, for Messrs. Newman & Dale, of Newcastle-on-Tyne, had her trial trip from the Tees. After adjusting compasses the steamer had a satisfactory run, when everything was found to be in perfect order, a speed of 10½ knots being obtained. She then proceeded to the Tyne to load. The engines, which are by Messrs. Blair & Co., Limited, worked smoothly and well during the whole period.

**Cardiff Castle.**—On December 21st the new steamer *Cardiff Castle*, lately launched from the shipbuilding yard of the Bute Shipbuilding, Engineering, and Dry Dock Co., Limited, Cardiff, and brought to Glasgow to receive her machinery, went down the Clyde on a trial trip. She proceeded direct to Gareloch Head, and after adjusting compasses made a run full speed, when the engines made 90 revolutions and indicated 1,070 H.P. The engines are 19 in. and 32 in. and 52 in. by 39 in. stroke, with two boilers, each 11 ft. 9 in. diameter by 10 ft. 6 in. long, and having four furnaces. During the trial the engines worked very satisfactorily, and the vessel, after leaving the Gareloch, steamed straight for London, where she will load for the River Plate. The trial was superintended by Captain Phalp on behalf of the owners, Messrs. Morel Brothers & Co., Cardiff. The vessel is 265 ft. long, 36 ft. broad, 21 ft. 6 in. deep, and carries 3,000 tons of cargo. The engines have been supplied by Mr. William Kemp, Glasgow.

**Waesland.**—On December 23rd the Red Star steamer *Waesland*, which has recently undergone a renovation and has had her compound engines converted into triple-expansion machinery by Messrs. John & James Thomson, Finnieston, Glasgow, went on her speed trials. The vessel was built in 1867 by Messrs. James & George Thomson, Clydebank. She was then called *Russia*. In 1885 Messrs. John and James Thomson fitted the steamer with new engines of the compound type, and at that time the vessel was lengthened, her dimensions being made 435 ft. long, 41 ft. broad, and 34.9 ft. deep, the tonnage being 4,752 tons gross, and good results were obtained with the new engines. The engines have now been made triple-compound, a new high-pressure cylinder having been added. The cylinders are now 32 in., 48 in., and 86 in. diameter, with a 4 ft. 6 in. stroke or piston. New boilers of large size have been fitted on board, working to double the pressure, 160 lbs. per square inch, instead of 80 lbs. as formerly. The heating surface, too, has been greatly increased. On trial the vessel obtained satisfactory results, the speed being 14 knots an hour.

**Cornubia.**—On December 23rd the steamer *Cornubia*, which was launched a few days ago by Messrs. W. Gray & Co., of West Hartlepool, and is the fourth built by that firm to the order of Mr. R. B. Chellem, of Truro, Cornwall, ran her trial trip. She measures 270 ft. in length over all, 36½ ft. in breadth, and 19½ ft. depth, and carries 2,550 tons deadweight. Her triple-expansion engines are supplied by the Central Marine Engineering Works of her builders, their dimensions being 19 in., 30½ in., and 51 in. by 36 in. stroke, with boilers to work at a pressure of 150 lbs. per square inch. She ran for four hours continuously at full speed, her engines making 85 revolutions per minute, the vessel's progress being at the rate of 11 knots per h

**Nadir.**—24th the steamer *Nadir*, which was launched at Belfast, a short time ago, and

which since then has received her rigging, boilers, and engines, &c., from her builders, Messrs. Harland & Woolf, left the Abercorn Basin for the purpose of making her trial trip. The *Nadir* is one of the three vessels for the Asiatic Steam Navigation Co., built by Messrs. Harland & Woolf.

**Zweena.**—The new screw steamer *Zweena*, recently launched by Messrs. J. Blumer & Co., North Dock, to the order of the Mersey Steamship Co., of Liverpool, left the dock and proceeded to sea for the purpose of having her trial trip. The ship is of the following dimensions:—242 by 34, and 19.6 mould, and has long full poop, with large deck-house on top. The latter is fitted out for 30 first-class passengers. After adjusting the compasses the vessel had a series of runs over the measured mile, when a mean speed of 12 knots was attained, which, considering the elements, gave every satisfaction to those on board. The engines, which were constructed by Messrs. George Clark & Co., of Southwick, worked smoothly throughout, and are of the triple-expansion type, with cylinders 20½ in., 33 in., and 54 in., and 39 in. stroke, with one double-ended steel boiler with a pressure of 160 lbs. per square inch.

**Sard.**—On December 28th the steamer *Sard* went on her trial trip, when she attained a mean speed of 11½ knots, which was considered highly satisfactory. This vessel was launched on December 20th from the yard of Messrs. Scott & Co., Bowling, to the order of Mr. Wm. Robertson, 88, Great Clyde Street, Glasgow, and was supplied and fitted with engines of the triple-expansion type, having cylinders 13 in., 21½ in., by 34 in. by 27 in. stroke, by Messrs. Muir and Houston, Harbour Engine Works, Kinning Park, Glasgow.

**Abbottshall.**—On December 30th the screw steamer *Abbottshall* built for the Kirkcaldy and London Steam Shipping Co. by Messrs. John Scott & Co., Abden Shipbuilding Yard, Kinghorn, went on her trial trip. She accomplished 13 knots an hour, or a knot more than was expected. Steam was got easy, and there was no heating in any way, the engines working smoothly.

**Petrolea.**—On January 3rd the s.s. *Petrolea*, launched a few weeks ago from the shipbuilding yard of Messrs. Craig, Taylor & Co., Stockton-on-Tees, was taken to sea for a trial of her machinery. The principal dimensions of the vessel are:—Length, 301 ft.; breadth, 37 ft.; depth, 26 ft. 8 in. The vessel has been built to the order of Alfred Stuart, Esq., of London, and has been specially designed and constructed by the builders for carrying petroleum in bulk; her bunkers are also arranged for carrying oil as fuel, and the vessel is built to the highest class in Lloyd's under special survey. The engines, of the triple-expansion surface condensing principle have been constructed by Messrs. Black, Hawthorn & Co., Gateshead-on-Tyne, the cylinders being 21 in., 34 in., and 56 in. by 42 in. stroke, two boilers 14 ft. 9 in. by 10 ft. 6 in., with six Brown's ribbed furnaces, working pressure 160 lbs. She has also Kircaldy's feed heater steam turning and reversing gear and steam brake; indicated power in ordinary working, 1,100 horse. The machinery worked well during the whole of the trial, when a speed of over 11 knots was averaged. Amongst those present were the following:—Owner's representative, Mr. J. Bissett; builders' representative, Mr. A. Parker; engineer's representative, Mr. Fleming; charterer's representative, Mr. Bushell; Lloyd's engineering surveyor, Mr. J. Walliker, and others. After the termination of the trial, which was altogether satisfactory, the ship behaving remarkably well in rather a rough sea, the vessel proceeded to Batoum to load her first cargo of petroleum.

**Thrush.**—On January 11th the new first-class composite gun-vessel *Thrush*, 6, left Sheerness for the official natural draught trial of her engines, which took place in the North Sea under the superintendence of the engineering officials of the Admiralty and the Medway Steam Reserve. The trial was of eight hours' duration, and was of a most satisfactory character. The engines working smoothly without hot bearings, while the boilers gave a plentiful supply of steam with a total absence of priming. The engines developed 804.5 H.P., which is 84.5 in excess of the power contracted for.

**Capella.**—The steamer *Capella*, the latest addition to the Star Line, of Calcutta, has had a successful speed trial run from the River Clyde to the Mersey, during which, notwithstanding boisterous weather, the engines worked smoothly and developed full power. The vessel was constructed for her owners, Messrs. Thomas and James Harrison, Liverpool, by Messrs. Charles Connell & Co., Scotstoun, on the Clyde, and

engined by Messrs. John and James Thompson, Finnieston, Glasgow. The *Capella* is 350 ft. long, 60 ft. broad, and 28 ft. depth of hold; her gross tonnage being 3,200 tons. The engines which, in ordinary working, developed 1600 I.H.P., are in the tri-compound type, the cylinders being 24 in., 40 in., and 66 in. respectively, with a stroke of 54 in. Steam is generated in two double-ended boilers 18 ft. in diameter and 16 ft. long, working to 160 lb. pressure.

**Matatua.**—On January 14th the s.s. *Matatua*, which has been built by Messrs. Robert Stephenson & Co., Limited, of Newcastle and Hebburn, for the Shaw, Savill & Albion Co., Limited, was taken on her trial trip. She is a steel spar-decked vessel of the following dimensions, viz.:—Length, 340 ft.; breadth, 41½ ft.; depth, 29 ft.; and she has been specially fitted up for the New Zealand frozen meat trade. The propelling machinery consists of a set of triple-expansion engines of about 1,700 I.H.P., and the vessel attained a main speed of 11.8 knots in four runs over the measured mile.

**Deseado.**—On January 17th the *Deseado*, built and engined by Messrs. Newall & Co., of Bristol, went on her official trial trip in the Bristol Channel. The *Deseado* has been built under Lloyd's survey, of steel, specially for the fruit trade on the River Plate, and measures 125 ft. between perpendiculars, by 26 ft. beam, by 9 ft. 6 in. moulded depth. She has triple-expansion engines, having cylinders 12 in., 18 in., and 31½ in. by 20 in. stroke, and steel boiler 10 ft. 6 in. by 10 ft. Fox furnaces. The hold is fitted with ventilating apparatus, consisting of an air blower and pipes laid in four lines through the hold perforated so as to distribute air throughout the whole area. The results of the trial were very satisfactory. The engines and supplementary machinery worked well, and steam was amply maintained at 9 knots speed.

**Fara.**—On January 17th this vessel, of 5,000 tons, built by Messrs. A. & J. Inglis, for the British India Association, went down the Clyde on her official trial, which, although taking place in very unfavourable circumstances as regards weather, was perfectly successful, and after completion of speed trials and adjustment of compasses the vessel proceeded to London to load for Brisbane. Among those present were:—Mr. D. Mackinnon, Mr. Macmichael (of Messrs. W. Mackinnon & Co.), Mr. Bates, of the Constructor's Department, attended on behalf of the Admiralty, as the *Fara* is to be placed on the armed cruiser list.

**Maori.**—On January 21st the steel screw steamer *Maori*, built by Messrs. C. S. Swan & Hunter, Wallsend, for the Shaw, Savill & Albion Co., Limited, had her official trial trip. The dimensions of the vessel are 334 ft. over all, 40 ft. beam, and 25 ft. 9 in. depth, moulded. Long poop, bridge-house, amidships and topgallant forecabin, cellular double bottom throughout; built to Lloyd's highest class on the three-deck rule, and under special survey. The engines are by the Wallsend Slipway and Engineering Co., Limited; cylinders 26 in., 42 in., and 69 in. by 45 in. stroke. The trial was attended by Captain MacKirdy, Mr. Carriock, and Captain Scotland, on behalf of the company. The mean speed on the measured mile was 12½ knots. After the trial the vessel proceeded direct to London to load for New Zealand.

**Seagull.**—On January 22nd the first-class gunboat *Seagull* went out to Spithead for further trials of her torpedo gear. In this vessel the air guns, of which she carries four on the after open deck, are mounted on a novel principle, the value of which it is the object of the trials to determine. The tubes are disposed in pairs on the starboard and port quarters as in the torpedo craft, but, instead of the axes being parallel, each tube is fitted at an angle of 2½ degrees from the normal, so that, when the projectiles leave the muzzle, they diverge at an angle of five degrees. It is thought that by this arrangement a greater number of hits will be recorded when the torpedoes are discharged from a vessel travelling at a high rate of speed. By the usual method of firing, as the projectiles pursue a parallel course, it is probable that, should one miss, its fellow will also miss the object aimed at, but with the new arrangement the chances are, as they follow diverging lines, that should one miss the other will strike the target, and one fairly good hit is all that is required to sink or maim an enemy. The *Seagull* was driven at rates not exceeding 140 revolutions of the engines, with the primary purpose of determining the proper angles at which to fire at an object at a known distance at various rates of speed. Up to the present time the practice has not been good.

**H.M.S. Sparrow.**—The new first-class gun-vessel *Sparrow*, 6,805 tons displacement, 1,200 I.H.P. recently built by Messrs. Scott & Co., Greenock, went on her speed trials about the middle of January. The trials were at full power, with forced draught, and took place in the North Sea, under the superintendence of the engineering officers of the Sheerness Dock and Medway Steam Reserve. The vessel was tested for four hours continuously, with highly satisfactory results. With the engines working at 175 revolutions per minute, a mean of 1,240 H.P. was attained, being 40 H.P. in addition to that contracted for. The speed of the *Sparrow* on the measured mile was 13½ knots.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

### PETROLEUM SHIPS.

To the Editor of THE MARINE ENGINEER.

SIR,—A gentleman speaking at the meeting of the British Association here, in section G, of petroleum ships, suggested: "that valves should be placed near the bottoms of the divisions of the different compartments, which, being opened during the operation of loading and discharging, would permit the oil to flow equally into all the compartments, and so get over the difficulty of keeping the vessel in proper trim, and not subject to undue strains." Now, sir, allow this gentleman to have command of a ship, and in half-an-hour he would not only drown himself, but every soul on board.

It is surprising the amount of uncertainty shown by most parties connected with shipping in reference to stability; and some day, and that shortly, we will hear of some oil boat that never returns, due to this very cause.

A short time ago I had a very good opportunity of seeing all the proceedings in connection with a new ship of this class, and subsequently in her working. Now on proceeding to the spouts for the first time, the captain was advised by the shipbuilders to fill certain tanks before taking in coal, and this I know was fully carried out. The consequence was, when her complement of coals were on board, but for the quay on one side, and a ship on the other, she would have capsized. And if the gentleman whose ideas are mentioned above had been in command she would have turned over altogether. Of course; if there had been more tanks full there would have been no difficulty in taking in the top-weight.

This brings me to the part which I wish to point out as a dangerous proceeding, and a custom that should be carried out with every care. The oil being discharged in port the ship bunkers, say, with three oil tanks full of water-ballast, and proceeds on her outward voyage. Now to save time at the loading port, (and these ships get quicker despatch than all others) the crew are set on to clean the empty tanks out, and as the coal is consumed the full tanks are pumped over the side, thus by the time the ship gets to her loading port, she is particularly tender generally, for the last tank is being pumped out when entering it. Now a good captain knows more about what his ship will stand than any shipbuilder. But what if a new man takes charge, who had not the experience of her first loading? May not the trying-to-beat-the-record system lead to fatal results? I believe there is more to fear from this penny-wise practice of saving a day in port, than from any explosion of gas or any other cause.

The extra day in port would allow the engineer more time to keep the machinery in a higher state of efficiency than he possibly can do under the present mode of working; and the captain would be relieved of a heavy responsibility.

Would any kind reader give me the principle on which most of these ships are run; that is, with empty coffer-dam.

And oblige yours, &c., R. C.

## THE ENGINEERS OF THE MERCANTILE MARINE.

To the Editor of THE MARINE ENGINEER.

SIR,—I doubt if there are many chief and assistant engineers attached to steamships who do not keenly feel the grossly inadequate position they occupy. This strong feeling has called into existence a widespread and growing disposition to assert their just claim to an official and social status more becoming the importance and value of the multifarious duties and indispensable services performed by them on board ship.

In this progressive age of leviathan vessels of most costly and careful construction, which from truck to keel display nothing but iron or steel, whose numerous internal appliances (eminently mechanical, economical, and labour-saving) require the constant supervision and acute professional abilities of the engineer to maintain in working order,—the position of the master and his mate is as anomalous as it is unfair to the engineer. Hitherto legislation has wholly been in the interests of the master and his so-called executive officers, and it is doubtless this one-sided legislation, backed by effete custom, which props up and maintains them in a position as obviously absurd as it would be untenable, were the indispensable nature and ever-increasing importance of engineers' services dispassionately considered.

The *Daily Telegraph* two years ago, in a forcible leading article on the duties and position of marine engineers, very truthfully remarked:—

"The chief engineer—the man who, in these days of derricks and pole masts, is absolutely the most important person on board the ship, without whom the captain might go on taking sights for months and not do the least good; without whom the chief mate might continue seeing that the decks are kept scrubbed and the brass work bright with no practical result—this important man is scarcely heard of on board ship. . . . Yet even the most conservative merchant-captain must admit that the responsibilities of the engineer are to the full as onerous as his own. . . . nor let it be forgotten that the sea-going engineer of to-day is pre-eminently a man of talent and of education; a person of great scientific knowledge, and in bearing and conversation assuredly the equal of those who, by the tyranny of custom, in the eyes of the public and in the regard of the crew, still take the lead of him."

As a rule, the older established the line and the more influential the company is, the more conservative and unfair its administration as far as it affects the engineers' interests and status. For instance, as has recently happened, a great mail-ship-owning company determines to make a departure from its beaten track, i.e., it acquires a number of the most modern type of cargo-ships of great carrying capacity and (as is fondly hoped) great earning powers. The managers are full of ideas of economy, their whole aim is to run this class of ship as cheaply as possible, and of course the question of wages receives due attention. They decide to reduce the rates of pay which obtain in their mailships, and come to the conclusion that the master and chief engineer shall be paid in proportion to their respective positions; therefore the former is given as much again as the latter. This decision ought to be satisfactory to the master. The chief engineer readily accords all that is due to the master, but he can scarcely be expected to reconcile himself to his relative position as exemplified in the matter of their respective wages, for as the head of the great spending department, by his economical and sound management of it, added to the maintenance of everything under his care (and what does not come under his supervision?) in efficient and good order, he does more than the master can possibly attempt in the direction of aiding the ship's earning powers.

In every conceivable way the engineer on board ship is placed at a disadvantage, and made to feel his position, or more correctly his utter want of it. A chief engineer in the service of the great mailship company just alluded to, is required to don the same uniform as that worn by the juniors, including the boiler-maker, therefore to all appearance the latter may be chief engineer of the vessel or vice versa.

Frequently the value of engineers' services, nay, their very existence, is ignored, as in the case of the fast steaming of the Atlantic racers, whose masters "wolf" the entire *kudos* attached to the beating and making of records. Does the coxswain of the victorious 'Varsity Eight credit himself with the entire success or coolly appropriate all the honour and glory won by the athletic rowers' brilliant exhibition of pluck and skill? Yet the part he takes in the performance and his share

of it are much on a par with the vaunted deeds of the master of an ocean greyhound, for, like the mariner, he is vigilant, does his best to steer a straight course and keep his craft clear of obstacles.

The striking inadequacy of an engineer's position, and in many instances his pay too, are usually attributed to the opposition of shipowners and masters, whose class prejudices, dating from the days of sailing ships, appear to be carefully conserved even in this age of engineering triumph and renown. Viewed in some lights this foolish nursing of hostile and jealous feeling is almost pardonable, but what can be said of the utter absence of even the shadow of generosity and fair-dealing, which is but too apparent in the offer made by the Government to engineers of ripe sea-experience to join the Royal Naval Reserve Force of their native land. The terms held out by the Admiralty are as follows:—A commission of a rank not higher than an engineer, a paltry position and uniform accompanied by no retaining fee, advantage or benefit of any description whatsoever.

Surely here is, with a vengeance, an unblushing attempt to barter nothing for something! It is much to be deplored that a few—a very few—engineers of presumably good attainments and extended experience should have accepted these monstrously insufficient terms, but the inference to be drawn from their action is, that they were actuated by purely selfish motives, inasmuch as they yielded to pressure from an influential quarter, thereby hoping to advance their own interests. Take a case in point: a mailship company possesses some modern vessels of great power and speed, specially constructed to act as armed cruisers in case of need, for each of which an annual subvention comes from the Admiralty to the directors, who, wishing to stand well with the Government, request those engineers who are eligible, to join the R.N.R. They accede, and a commission of the rank of engineer is received by the chief, second, third and fourth engineers. At any subsequent period should all four proceed on active service, they will all be treated alike as far as pay and position go.

Speaking in the capacity of an engineer of many years sea-experience, and consequently as one who feels most strongly on all matters which in any way affect the interests and well-being of my fellow-sufferers afloat, I am convinced that standing idly by and, like doting old women, "hoping for better days," will not tend to bring a marine engineers' millennium much the nearer. Neither am I an advocate of a hasty and aggressive policy, on the contrary I should prefer to see the thousands of followers of our great profession banded together in a strong and unassailable association, having for its primary object the social advancement of its members, which, to a combination so powerful and irresistible, could not prove an object either difficult or long of attainment. With social and professional advancement would come influence and position in the circles of science and commerce; then should we assuredly find ourselves able to demand, and if necessary enforce a just appreciation and thorough recognition from the proper quarter of the value of the services of the engineers of the Mercantile Marine. I consider the formation of the Institute of Marine Engineers may be hailed as a step in the right direction, and one which the *elite* of our calling should approve of in a practical manner by increasing its membership and utility.

I am, Sir,

Yours respectfully,

AN EX-ENGINEER OF A MAILSHIP.

## FAST PASSAGES.

To the Editor of THE MARINE ENGINEER.

SIR,—The October issue of your interesting journal reached my hands abroad, and the item of its contents which most attracted my attention was a letter under the above heading, and signed—anomalously enough, considering its contents—"Justice."

My first impression, on reading it was that it was a ship-master who wrote it, probably to while away the monotony of his leisure time, and, not unlikely, with a view to "draw some of us engineers out" for a bit of prospective fun.

This supposition was borne out by the *prima facie* absurdity of his assertion that "an engineer has no more to do with the making of a fast passage than the man who drives a winch has to do with the fast discharge of cargo."

But, like the fable of the "boys and the frogs," what is fun

to him is pain to us, and lest erroneous ideas should be created in the minds of the uninitiated, I take the trouble of replying to what I would otherwise pass over in the spirit in which I assume it was written.

"Justice" very magnanimously agrees with a leading article in your July number, that "engineers are entitled to all the praise and credit for the successful driving of what he terms the engine," as if our obligations ended there, and, by some peculiar process of reasoning—incomprehensible to our feeble intellects—he seems to arrive at the conclusion that this has nothing to do with the progression of the ship's hull through the water. His simile of the "man and the winch" can hardly be called a happy one either, inasmuch as the winch-driver is invariably a deck hand and, although we must admit that his humble efforts do not materially contribute towards rapid output, I presume "Justice" will concede that the state of efficiency in which these much-abused motors, the winches, are maintained by the engineers, as one item of their multifarious cares, have a very great deal to do with the rapid discharge of cargo.

"Justice" goes on to say that "the captain is the man who makes or mars a passage." My own experience on that point is that there is a good deal of "mar" and very little "make" about it. Has any of your readers ever gazed idly astern, and watched the beautiful S shaped curves described by the vessel's wake in the water, while the unfortunate officer below storms impotently at the exhausted firemen for losing a few pounds of steam, all unconscious that his efforts to accelerate speed by the revolution are being frustrated by the knot. Who has to make good the effect of this circular steaming? Whose the abuse and blame for the costly fuel thus recklessly wasted—to the exclusion of cargo—in tons, while the much reviled engineer seeks to prevent loss—even in pounds—by the thousand and one devices known only to practical men? Whose the real responsibility, while the nominal usurper of it arrogantly steps the bridge with white hands and brass buttons. Echo answers, whose?

"Justice" would have us believe that with the ship-master, and with the ship-master only, lies all the anxiety, constant duty, risks, and responsibility, and that these cares and responsibilities cannot be shared by the engineers. I wish "Justice" had seen the blanched faces of captain and officers—brave men too—the look of mute and eager enquiry that met my gaze, day after day, and night after night, during an Atlantic hurricane some time ago, when, with decks swept, wing furnaces out, ship nearly on beam ends, and engineers and firemen in the bilges trying to keep the pumps clear, their heads ever and anon roasted by contact with the boilers, or almost suffocated by the swish of bilge and sea-water as the deeply laden vessel tossed like a log in the trough of the sea! Ah, yes, my friend, the responsibility is shared, but not the honours. We got home, however, a wreck, the captain was the lion of the day, and we, well, we only did our duty.

Who shall record the unspoken anxieties, the solicitous vigilance of the men immersed in their iron dungeons, with least hope of escape themselves from more than one peril? The men to whom every unusual click or sound serves but as a note of warning with the lives of the crew and passengers in their care under critical circumstances, say in heavy weather, on a lee shore, when some trivial but hitherto undetected flaw or defect reveals itself. While others sleep their busy brains are revolving methods of combating the impending danger. Their lips are mute from the inner consciousness that the powers on deck have not the skill, if they had the will, to help them. Can the commander and his deck staff share their responsibility? And yet we are told that at the post of danger and duty, without even the incentive of excitement to encourage them, that these men have no anxiety or responsibility.

But putting aside these hazards, which are, after all, only extreme incidents in a seafarer's life, and are common to both master and engineer, and taking up the assertion that the "constant duty" is the lot of the former only, and that his constitution has to pay the price, I would ask, "Is this gentleman really serious?" Is it not a fact that the "constant duty" only exists with him while the critical period exists? Has he not long intervals of relaxation and pleasure, and when his anchor is down, is he not comparatively a free man? Where, then, is the "constant duty?" Take the case of the latter officer. He has, of course, his periods of relaxation too, but when the vessel arrives in port is his duty also ended; far from it, then begins the exercise of the practical forethought, combined with arduous labours, which are destined to make or mar the coming voyage, and of which the former knows abso-

lutely nothing. Has "Justice" yet to learn that "sailors," as distinguished from "seamen," are proverbially and enviably the healthiest men in existence. Who amongst us could not pick out the fallow and jaundiced visages of the engineer and his assistants when the muster roll is called, the result of constitutions impaired by attention to duties in a sickly and depressing atmosphere, with the temperature ranging far and away above the nineties of Fahrenheit. Verily these are the men who sacrifice their health to serve their owners unacknowledged and unrequited.

In writing the foregoing, I have no desire to detract from the value of a commander's services as a navigator. On him, as such, devolves the obligation of steering his vessel clear of many dangers. That these services are at times arduous no sane man can refuse to believe, but when he declares that his is the *only* responsibility, he forgets that others on board are amenable to the Board of Trade as well as he, and I place such silly twaddle on a par with his schoolboy bounce about the keys of the safety valves, and "full pressure," as if all the pressure in existence would avail if the machinery was not maintained in an efficient condition to utilize it to the best advantage.

But it is the old story over and over again. Time alone, and not wordy warfare, must inevitably drive home to shipowners and masters alike the patent truth that the age of sail, with all its conservative ideas, which would keep passengers and crew alike on hard tack and salt junk, *ad infinitum*, is past; that a new and progressive order of seafarers has arisen to meet the exigencies of progress, and eventually to take the place of the venerated old shellback. He served his purpose, no doubt, as we shall serve ours, and in turn, stand aside to fulfil the doctrine of the survival of the fittest.

"Justice" winds up a diatribe, which seems to have no higher aim than his own aggrandisement, with a pharisaical allusion to the great tribunal before which we must all; sooner or later, appear. Has he reflected that at the self-same tribunal he himself will assuredly be called to account for his efforts to flch away the creditable reputation of his fellow-men. All our puny efforts are, at best, as those of ants in the great work of life, but I, for one, cannot repress the conviction that ere this planet of ours has become a century older, the future historian of the progress of marine propulsion will entertain his students by an allusion to the antiquated incongruity of placing an unscientific, and perchance wholly illiterate man in supreme control, as an amusing illustration of the primitive methods in vogue during the nineteenth century.

W. L. P.

## THE PROPOSED INCREASE OF THE AMERICAN NAVY.

THE proposed new American scheme of naval construction involves the building and completion between the present time and the close of the year 1903 of ten battleships, each of 8,000 tons, and costing in all £10,000,000; eight battleships, each of 8,000 tons, and costing in all £8,000,000; twelve battleships, each of 7,000 tons, and costing in all £10,800,000; five battleships, each of 6,000 tons, and costing in all £3,600,000; ten armoured rams, each of 3,500 tons, and costing in all £3,600,000; nine belted cruisers, each of 6,250 tons, and costing in all £5,940,000; four deck-protected cruisers, each of 7,400 tons, and costing in all £2,800,000; nine deck-protected cruisers, each of 5,400 tons, and costing in all £5,040,000; two deck-protected cruisers, each of 4,000 tons, and costing in all £820,000; five despatch vessels, each of 1,200 tons, and costing in all £500,000; three depot-ships, each of about 4,500 tons, and costing in all £1,200,000; and fifteen torpedo gun-vessels, each of 900 tons, and costing in all £1,500,000. The total number of ships is 92, the total tonnage 498,450, and the total estimated expense of construction £53,700,000. Upon this the *Daily News* remarks:—This means that the vessels are to cost, one with another, about £109 a ton. Mr. Gladstone, in a recent speech, expressed his opinion that the work would probably cost much more in America than in England. Examination of the cost of recent British ships of equivalent classes reveals the fact that, taken all round, the outlay has been only at the rate of about £59 a ton. Protection, therefore, may be said to add, not as Mr. Gladstone roughly puts it, "40 or 50 per cent.," but over 94 per cent. to the cost of constructing war-ships.

**THE DEEP-WATER DOCK AT SOUTHAMPTON.**—The new deep-water dock at Southampton is nearing completion, and will, it is hoped, be ready for opening at Easter. It would have been completed several months ago but for two disasters, which have involved a further expenditure of between £30,000 and £40,000. The water area of the new dock will be 18 acres, with a depth of 26 feet at low water spring tides, a sufficient depth to float the largest merchant steamship at low water. There are three quays, north, south, and west, of about 1,800 feet in length, and the east quay, of which the existing quay is backing, is 800 feet long. The entrance is 175 feet wide, or 25 feet wider than the entrance to the present outer basin. The quay walls are built of solid concrete without the red brick facing which is a feature of the extension quay. The copings, steps, and angles are of fine grained Cornish granite. The walls extend 3,786 lineal feet, and are 51 feet high. The sea bank enclosing the dock is 1,043 yards long, and is designed to resist a pressure of 25 feet of water. Its basis is of chalk, of which 87,208 tons were used. The construction of the dock was begun in September, 1887, and the total cost will be about £270,000.

**Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships from December 9th 1889, to January 20th, 1890.**

- 19714 W. H. Allen, R. Wright, and R. W. Allen. Steam engines.  
 19887 J. H. Laidman. Fastening hatchways, &c.  
 19906 W. H. Lonsdale. Cement for covering boilers, &c.  
 20025 Francois de Wernicki and Comte Thadée D'Okaza. Vessels propelled by screws.  
 20060 H. N. Harvey. Steam-engines.  
 20089 C. Wells & E. G. C. Bomford. Steam-engines.  
 20165 S. Snellenburg. Reciprocating propellers for vessels.  
 20638 H. Barcroft. Propelling and steering boats and other vessels.  
 20783 R. Hall. Propellers for ships or vessels.  
 20795 G. C. Downing. Hydraulic propulsion of ships.  
 20803 E. Edwards. Screw propellers.  
 20910 W. B. Yeo. Compound engines.  
 20912 J. Mills. Water tube steam generators.  
 20939 M. Porthelm. Protecting water gauge glasses.  
 20988 J. A. Clarke. Compound engines.

**1890.**

- 9 P. Fisher & G. B. Richards. Slide valves of steam-engines.  
 10 P. Fisher & G. B. Richards. Telegraph gear.  
 83 J. G. Williams. Construction of steam boilers.  
 181 C. Wells. Steam and vapour engines.  
 147 G. W. Newall. Quadruple and other expansion engines.  
 185 A. Vogelsang. Screw propellers.  
 197 R. G. Lacey. Sea anchor and oil distributors.  
 208 S. J. Howells. Sea oiling apparatus and oil storage reservoir.  
 284 W. P. Thompson. Loading and unloading ships. (J. M. Paterson and T. W. Wade, both at present on the High Sea).  
 307 J. Imray. Piston rod packing (F. P. Martin, United States).  
 443 J. Wild. Governors.  
 524 G. Lawson. Steam boiler furnaces and flues.  
 535 G. Rhodes. Self-acting dampers.  
 545 F. A. S. Farewell. Automatic valve or plug for ships boats.  
 645 J. I. Thornyeroff. Steam generators.  
 732 B. Brown. Boiler flues.  
 740 W. G. Clark. Watertight doors (J. S. Clark, Spain).  
 801 R. P. Blance. Securing propellers on shafts, so that they can be more easily removed.  
 810 H. Schofield. Glands of piston rods.  
 811 W. Truswell. Furnaces of steam boilers.  
 826 H. Muncaster. Balanced slide valves.  
 856 A. Kenge. Crank shafts.  
 861 W. H. Harfield. Steering gear for ships.  
 912 W. W. Horn. Piston rod packing (W. G. O., U.S.)  
 947 E. C. Urry. Compound steam-engines.

**BOARD OF TRADE EXAMINATIONS.**

NOTE.—1 C, denotes First Class; 2 C, Second Class.

December 21st, 1889.

Bagnall, J. J. B. 2C N.Shields  
 Brown, E. T. .. 2C "  
 Brown, J. .. 2C Glasgow  
 Coward, F. .. 2C N.Shields  
 Davies, G. P. .. 1C Cardiff  
 Dean, A. .. 2C N.Shields  
 Deason, F. .. 2C Glasgow  
 Gilgillan, J. L. .. 2C "  
 Holman, A. .. 2C Cardiff  
 Humphreys J. .. 2C "  
 Hunter, J. .. 1C Glasgow  
 Hutton, J. .. 2C "  
 Irvin, J. E. .. 1C N.Shields  
 Jones, W. C. .. 2C Cardiff  
 Vilottrup, N.P.C. 2C Glasgow  
 Laidler, J. .. 1C N.Shields  
 McDowall, W. .. 2C Glasgow  
 McNair, A. .. 2C "  
 McTaminy, C. .. 2C "  
 Malmberg, C. .. 2C Liverpool  
 Murphy, J. T. .. 2C "  
 Price, J. .. 1C Cardiff  
 Robinson, T. C. 1C Liverpool  
 Ross, J. A. .. 2C Glasgow  
 Shopland, G. T. 1C Bristol  
 Sparks, W.H. .. 1C N.Shields  
 Stewart, J. .. 1C Glasgow  
 Swinburn, J. B. 2C Liverpool  
 Weir, R. G. .. 1C N.Shields  
 Westington, J. .. 1C "  
 Williams, J. W. 2C Liverpool  
 Williams, W. H. 1C "  
 Wood, R. J. .. 1C N.Shields

December 28th, 1889.

Anderson, Thos. 1C N.Shields  
 Anderson, Wm. 2C London  
 Bright, Robert. 2C N.Shields  
 Cameron, J. G. 1C London  
 Crichton, Wm. .. 2C N.Shields  
 Cunningham, A. 2C Sunderl'd  
 D'Audilly, G.W. 2C Hull  
 Danks, Ambrose 1C Liverpool  
 Dixon, John .. 1C "  
 Duff, Robert .. 1C N.Shields  
 Edgecombe, J. .. 1C Sunderl'd  
 Forrest, G. L. .. 1C N.Shields  
 Graham, Thos. .. 2C "  
 Gridale, Jos. W. 2C "  
 Haswell, Jas. A. 2C N.Shields  
 Isaac, Wm. .. 1C Liverpool  
 Johnson, Thos. 2C Hull  
 Leggett, A. A. .. 2C Liverpool  
 Longley, J. B. .. 2C Hull  
 Lynn, Robert. .. 1C Sunderl'd  
 McJasnie, Jas. .. 1C N.Shields  
 Moody, J. O. .. 1C Sunderl'd  
 Purchase, A. E. 1C London  
 Robinson, R. D. 1C "  
 Rodger, H. S. .. 2C Liverpool  
 Taylor, E. E. .. 2C Sunderl'd  
 Tempest, J. K. 2C "  
 Temple, Ed. .. 2C N.Shields  
 Topley, Joseph 1C Liverpool  
 Turnbull, Alex. 2C "  
 Tweedie, John. 2C "  
 Welburn, H. .. 2C Hull  
 Wells, F. O. .. 1C Liverpool  
 Whitham, Wm. 2C London  
 Williams, R. H. 2C Liverpool  
 Wilson, John .. 1C "

January 4th, 1890.

Abraham, W.E. 2C Cardiff  
 Brown, John .. 1C Glasgow  
 Brown, John M. 2C "  
 Campbell, G.M. 2C "  
 Currie, Arch. .. 1C Liverpool  
 Davies, Daniel 1C Cardiff  
 Ellis, Joseph .. 2C Liverpool  
 Garraway, J. G. 2C Glasgow  
 Lindley, Jona. 2C Liverpool  
 Mann, David S. 2C "  
 McEwan, W. G. 2C Glasgow  
 McGregor, Peter 2C Liverpool  
 Newton, Richd. 2C Cardiff  
 Pringle, Peter. .. 2C Glasgow  
 Ritchie, W. G. 2C "  
 Sharp, Jas. .. 1C "  
 Thomas, W. .. 1C Cardiff  
 Watt, Wm. .. 1C Glasgow

January 11th, 1890.

Abolit, John W. 1C Leith  
 Bolton, Geo. H. 2C "  
 Bruce, Alex. .. 1C London  
 Cannon, Thos. .. 1C Liverpool  
 Drummond, W. 1C London  
 Edwards, David 2C Leith  
 Hay, Robert .. 2C Greenock  
 Hughes, Joseph 1C Liverpool  
 Hunter, Robert 2C "  
 LeBurn, Thos. .. 2C Dublin  
 McCairn, Mthw. 2C London  
 McGilton, Thos. 2C Dublin  
 Mehafeff, John 2C "  
 Miller, Daniel .. 2C Greenock  
 Neill, John .. 1C Leith  
 Nielsen, O. C. V. 1C Greenock  
 Peace, Alfred. .. 1C Leith  
 Parrish, Rob. W. 1C Liverpool  
 Price, James .. 2C "  
 Roberts, C. W. .. 1C Greenock  
 Sanderson, J. D. 2C Leith  
 Seville, Thos. .. 1C London  
 Wilson, James 2C Leith

January 18th, 1890.

Acford, Wm. .. 2C Plymouth  
 Adamson, S. J. 2C N.Shields  
 Brimer, A. .. 1C Liverpool  
 Christopher, W. 1C Plymouth  
 Farquharson, J.T. 2C N.Shields  
 Gillison, Jacob 1C Plymouth  
 Gregory, Geo. E. 1C Cardiff  
 Greig, Chas. M. 1C Dundee  
 Hardie, T. G. .. 2C London  
 Hanzell, J. B. .. 1C N.Shields  
 Hughes, P. L. .. 1C London  
 Humble, R. .. 2C N.Shields  
 James, Wm. A. 1C Cardiff  
 Kydd, John .. 2C Dundee  
 Macarthy, H. .. 2C N.Shields  
 Pow, W. S. .. 2C "  
 Reid, R. P. .. 2C Leith  
 Robertson, G.W. 2C London  
 Robertson, W. S. 2C Dundee  
 Robinson, Wm. 2C N.Shields  
 Ross, George .. 2C London  
 Rutherford, R. 1C Cardiff  
 Scott, G. H. .. 2C N.Shields  
 Spiers, R. H. .. 2C "  
 Steele, John .. 2C Dundee  
 Townsend, Jas. 2C London

# The Marine Engineer.

LONDON, MARCH 1, 1890.

IT appears that Mr. Samuel Plimsoll is not disposed to rest quietly with the present interpretation of the Merchants' Shipping Act of 1876 with regard to the marking of a load line. It will be remembered that the two sub-sections defining the marking of such load lines, apparently leave the marking to the discretion of the owner, and is marked by him as merely defining his intentions as to the maximum load line to which the ship is to be loaded for a particular voyage, or until notice is given of an alteration. We can well imagine that a load line thus at the discretion of an owner is a very elastic boundary, and that his intentions, however good, when the line is being marked, may be subjected to modifications under the stress of peculiar circumstances. This is hardly what was popularly intended to be the effect of this Act as regards load lines, it certainly being generally desired that such a load line should be of an authoritative character, and marked under the best advice that could be obtained to ensure the greatest margin of safety (compatible with the fair interests of the owner) for the vessel, and for the lives of the seamen employed in her. Though we can have every sympathy with an owner who may find himself, as he thinks, unnecessarily interfered with in many ways by external authority, and though realising that legislation would be the pleasantest where we all had the discretionary power of applying such legislation to our own cases, we cannot but sympathise with Mr. Plimsoll in the view that independent expert regulation of such an important matter as a maximum safety load line would be desirable, seeing that the lives and safety of others often depend upon its determination. We see that Mr. Plimsoll is intending to follow up the Merchants' Shipping Act of 1876 with an amendment on this load line clause. The amendment of the sub-sections proposed are of the following nature:—“(2) The centre of this disc shall be placed at such level below the deck line, marked under the provisions of this Act, as may be approved by the Board of Trade from time to time, and shall indicate the maximum load line in salt water to which it shall be lawful to load the ship until the position of the disc is altered by direction of the Board of Trade.” The effect of this clause would evidently be to make the Board of Trade the

arbitrators of a suitable position of the maximum safety load line, without the matter being left (as at present) to the discretion of the shipowner. This would be but another item of the responsibility assumed by the Board of Trade as to the effective administration of shipping for the safety of the human beings employed therein, and will be another worry added to the many that shipowners frequently groan under, but which, after they have grown accustomed to them, are admitted, we think, by most parties to be beneficial to the majority. In fact, should this proposed amendment become law we do not think it will make any difference to the respectable section of shipowners who are always desirous of doing their best for the safety and efficiency of their vessels, whilst it will only prove obnoxious to that smaller minority of owners which is supposed to exist who are anxious at all times to sacrifice anything in efficiency to the primary necessity of making money. Mr. Plimsoll, we think, has up to date deserved well of his countrymen, especially those who devote their lives to maritime pursuits, and we are glad to see that he has still sufficient energy to try and perfect the noble work with which his name has been so long intimately associated.

A MEETING of the Institute of Marine Engineers was held at the Langthorne Rooms, Broadway, Stratford, E., on January 31st, Mr. G. W. Manuel, superintendent engineer, Peninsular and Oriental Steam Navigation Company, being in the chair. An interesting paper upon “Ventilation and Heat Radiation” was read by Mr. A. Sommerville, chief engineer of the steamship *Bengal*. We are very glad to add our congratulations to those of the chairman on Mr. Sommerville being the first member, who is a chief engineer in active service, to come forward with a paper to read before the Institute, and we hope that many of his fellow-engineers will follow suit, and feel sure that no more interesting matter can be offered to such a meeting than an account of the ingenious devices often devised by engineers at sea to temporarily repair sudden breakdowns. Besides, the information as to the causes of such breakdowns of the parts most readily effected would be of the utmost value to the engine building and designing profession at large. There seems to be much want of an improvement in the ventilation of engine-rooms and stokeholds in order to diminish the extreme heat, and to supply good fresh air. The author states that

nobody but those practically acquainted with the facts, and having knowledge of the conditions of temperature in the Red Sea, or within the tropics, can form any idea of the amount of suffering and endurance that have to be gone through by the men in pursuit of their arduous calling. The boxed-up type of engine-room was remarked upon as being most objectionable for passengers and engine-room accommodation. It appears to be a mistake to suppose that closing the heat into the engine-room protects the passengers from its effects, and experience seems to point out that the more the engine-room spaces are boxed in the hotter is the passenger accommodation in the midship portion of the steamer. Experience seems to prove that any amount of covering with non-conducting material of every portion of the boilers, pipes, and machinery pays, in the greater comfort of those working in the engine-room, and in the coolness of the ship as a whole. Although the question of "Ventilation and Heat Radiation" has engaged the attention of many persons, it was the opinion of the assembled meeting that little had been done to develop any desirable system of ventilation to keep down the temperature, and to supply good fresh air to the engineers and stokers. It was regarded as very necessary that the sides of the engine-room should be left open to the deck, as the iron plating will transmit the heat throughout the vessel to a greater distance than might be supposed. We should be glad if any of our sea-going readers could offer any suggestions as to practicable means of ventilation that might have come under their notice. We are glad to hear that the Institute of Marine Engineers is flourishing both financially and in its membership, and is still upon the increase, and we shall have much pleasure in the future in receiving and noting the reports of their various transactions.

FOREIGN Governments are still doing their best to vie with the older States in the possession of a formidable modern navy. Chili is going ahead with an addition of new vessels to her navy, as she considers it absolutely necessary to hold a position as a maritime power, as most of her large towns are upon the sea coast, and are almost unapproachable by land, and are dependent for their supplies on the communications by sea. Messrs Laird Bros. have just completed two powerful torpedo war boats of the *Rattlesnake* class, which showed herself during the Manœuvres of 1888 and 1889 to be a most useful adjunct to the Fleet, and which, as is pretty generally

known, was built by Messrs. Laird Bros. They are large enough to undertake distinct, independent operations at sea, being 240 ft. in length, and 27 ft. 6 in. breadth, and are to work under a forced draught indicating 4,500 H.P., with which a speed of 20 knots is expected. These will form formidable first-class gunboats and with their large size will provide comfortable accommodation for the crew. The armament consists of three 14-pounders, and four 3-pounder quick-firing guns, two of the former being arranged on the forecastle so that they can both fire right ahead, the third on the poop commanding a range right round the stern. The torpedo armament consists of five torpedo guns, one in the bow, and the other four on the broadside. The hull is of course divided into a number of separate water-tight compartments. Good freeboard at the ends, so essential in this class of vessels when being driven fast in a seaway, and a high platform for the guns, is secured by topgallant forecastle and half poop, which also increases the space available for accommodation.

THE United States have now made definite recommendations through Mr. Tracey, the Secretary of the Navy, for a navy of 227 vessels, at a cost of nearly 350,000,000 dols. A considerable discussion was entered into as to the desirability of at once building heavy line-of-battleships, but the minority considered that the present policy of building gunboats, torpedo-boats, and fast cruisers should be for the present continued. The suggestions for the formation of a new navy includes 38 line-of-battleships of various classes, Monitors, 11 rams, 41 cruisers, and 29 gun vessels and dispatch cruisers, and 101 torpedo-boats. To carry this navy up to the total strength suggested in the course of a generation would require an annual appropriation of about nine million dollars, so that they are not disposed to rush at the suggestion with undue haste.

THE fact that in the experience of shipbuilders and engineers throughout the kingdom, since the year began, very few new contracts have been booked, and that, more recently, there has been an almost absolute suspension of inquiries, forms perhaps matter for congratulation rather than regret. The state of affairs this is indicative of, betokens continued and prospective activity for the shipbuilder, though not of the high pressure nature of the past ten or twelve months. There are still owners who have contracts to place, but so long as the prices of material

and labour continue as high as they presently are, and especially so long as the great amount of work in hand lasts, and workmen have so much the upper hand, there will be hesitancy in placing new contracts. Apart from the question of price, delivery at any reasonable period cannot in the present circumstances be guaranteed. The effect of all this is, that companies with contracts to place are holding off until the natural balance asserts itself, and builders' prices become cheaper.

## INSTITUTE OF MARINE ENGINEERS.

A MEETING of the Institute of Marine Engineers was held at the Langthorne Rooms, Stratford, on Friday, 31st January, under the presidency of Mr. G. W. Manuel, Superintendent engineer, P. & O. Steam Navigation Co., when a paper on "Ventilation and Heat Radiation," by Mr. A. Sommerville, chief engineer of the steamship *Bengal*, was read. Owing to the indisposition of Mr. Sommerville, the paper was read by Mr. J. R. Ruthven.

The Chairman, after commenting briefly on the importance of the subject, referred to Mr. Sommerville as the first member, being a chief engineer in active service, who had come forward to read a paper before the Institute, and that he deserved great credit for doing so.

The paper dealt with the prevailing condition of things as regards the ventilation of steamers; the inadequate means provided for lessening the amount of heat radiating from all parts of the machinery, and the results which followed directly and indirectly. The elementary principle on which ventilation was based was shortly touched upon, and the difficulties in the way of applying a perfect system to the various styles of steamers built, and the still greater obstacles in the way of applying it to the engine-room and stokehold were referred to.

The difficulties experienced by engineers, and the responsibilities resting upon them, in the discharge of their duties in the more modern steamers were also remarked upon, and the immense disadvantages under which they laboured, when, in addition to the care and attention demanded, they had to undergo the torture of a badly-ventilated engine-room and stokehold, accompanied by the extreme heat, were considered as being detrimental, not only to themselves, but their employers, or quoting *verbatim* from the paper itself:—"No one but those engineers, firemen, and trimmers who have been employed running up and down the Red Sea, or anywhere within the tropics, can form any idea of the unnecessary amount of suffering and endurance that have to be gone through by them in pursuit of that arduous calling which has done so much for the prosperity of our country. Indeed, it is not too much to say that had it not been for the ingenuity of our marine engineers and architects, we could never have held the proud position we do among the nations of the earth. It is very gratifying to us, as a body of marine engineers, to see the triumphs of our professional brethren in producing such wonderful results of mechanical skill and ingenuity as the latest greyhounds of the Atlantic, which seem to be able to make such fast passages regardless of wind and weather without a hitch apparently, or if there has been, the engineers have had resources enough to overcome and hold on their course. A glimpse into the engine-room of one of these steamers, it may be remarked in passing, is given in the *Contemporary Review* of January, 1890."

The boxed-up type of engine-room was remarked upon as being most objectionable both for passengers and engine-room accommodation, the crude ideas possessed by many that so long as the heat is bottled up in the engine-room spaces the rest of the ship will be cool were likewise dwelt upon, and illustrations based upon experience were given to show that the more the engine-room spaces are boxed in the more uncomfortable and hot is the whole passenger accommodation, if in the midship portion of the steamer. The immense advantage and saving of coal and fresh water resulting from the covering with non-conducting material every portion of the boilers, pipes, and

machinery was proved by experiments extending over several voyages in one steamer, showing that the cost of covering the portions which radiate the heat in the engine and boiler spaces is fully recompensed by the saving and greater comfort to those working in the engine-room, involving also greater interest in their work and fewer changes in the crew.

The discussion which followed the reading of the paper was sustained by Messrs. F. W. Shorey, J. G. Hawthorn, J. H. Thompson, J. McF. Gray, W. C. Roberts, and others, during which several forms of ventilators and systems of ventilation were referred to, and the great need there unquestionably is for more attention being paid to the whole subject introduced by the paper.

It was stated that the question of "Ventilation and Heat Radiation" was at present engaging the attention of many people and nations, and as the question was one which affected the travelling public and the steamship owner, as well as the engineer and his staff, its importance was made manifest. It seemed to be well established that the practice of boxing up the engine-room without leaving the sides open to the deck is a very objectionable one both to passengers and crew; the extreme heat being transmitted along the iron plating to a greater distance than might be supposed. As the interests of owners are parallel to those who travel in their steamers in respect to the desirability of providing cool quarters and comfortable accommodation, it seems reasonable to look for an improvement in what was evidently considered, by the writer of the paper and those who were present, as a matter which called for more than casual attention.

The discussion was adjourned, and the honorary secretary announced that it would be continued on Tuesday, 18th February, at 7.30.

It was also intimated that Professor Lewes, of the Naval College, Greenwich (one of the honorary members of the Institute), is giving a course of lectures on Friday evenings in the Town Hall, Stratford, and that the first lecture delivered on the previous Friday was very interesting. It was announced that the membership of the Institute is increasing and the finances in a satisfactory condition. The meeting closed with the usual votes of thanks.

A MEETING of the Institute was held in the Langthorne Rooms, Stratford, E., on the 18th inst., under the presidency of the Honorary Secretary, when the discussion on the paper read at the previous meeting was continued.

The Chairman opened the proceedings by giving a brief *resume* of the various ideas suggested by the paper, of which proof copies had been already supplied to members for the purpose of discussion. The presence of carbonic acid and other gases, and modes of expelling them, were referred to. The plan adopted in mines for ventilating workings, and drawing the foul air to the upcast, was mentioned, and referred to frequently in the discussion as the foundation of a good system of ventilation; but when in place of the upcast being through the stokehold as its natural and proper channel, the engine-room skylight was made to usurp the province of the funnel, the results were highly detrimental both to ventilation and the efficiency of the machinery, inasmuch as the draught was away from, instead of towards, the furnaces, and the coal dust and floating particles from the stokehold were carried into the engine-room, resulting in the open oil-boxes becoming filled with grit, and tending to heat the exposed bearings, and bring about the consequent worry, anxiety, and fatigue to the engineers, and prospective expense to the ship. The want of attention given to the accommodation provided for engineers when off duty in many of the smaller lines of steamers was alluded to, and the frequent changing of engineers resulting from this, was remarked upon as being detrimental both to the interests of the owner and the machinery. Attention was next called to the injury done to boilers by injudiciously allowing the cold air to pass down the stokehold ventilator in great quantity, especially when cleaning fires, frequently causing leaks at the back ends of the fire-boxes. In connection with this it was suggested that it is a good plan to have an arrangement of gear led into the stokehold for shifting the ventilator cowls head to wind when the furnace or tube doors require to be opened, so as to lessen the introduction of cold air, and thus make the ventilator nearest the doors in question an upcast. The boxed-up style of engine-room was considered to be illustrative of the type which was referred to as inducing the evils resulting from the narrow engine-room skylights

becoming the vent for the heated atmosphere and dust, in place of the funnel and uptake in the stokehold. The disadvantages of fans driven off the main engine shaft was alluded to as being only available when the shaft is in motion, whereas ventilation is wanted quite as much when the steamer is at ports of call, and the main engines stopped. The various forms of ventilator cowls were touched upon; also various systems which had been tried with more or less success: as the system of leading a pipe into an annular space around the funnel or into the funnel itself, with or without the application of exhausting fans. The questions as to the loss of heat and fresh water were referred to, and the importance of covering every available portion of pipe, and limiting as much as possible the steam supply for culinary and other ship's purposes were urged.

The discussion was entered into by Messrs. J. McF. Gray, D. G. Hoey, J. H. Thomson, W. W. Wilson, R. Duncan, W. M. Thomas, and Captain Froude, while Mr. R. Adam read the remarks of Mr. Buckwell, who was unable to be present. The Chairman read a few remarks by Mr. Ruthven, and a paragraph from the *Lancet* referring to an article which had appeared in the *Engineer* inspired by the paper under discussion.

During the discussion the theory of ventilation and the principles and formulæ on which the theory is based, were shown and illustrated by diagrams. The necessity of having a proper system of uptake and down-cast was pressed, and the need for an efficient arrangement of ventilation based on true scientific principles was shown. The system in operation in some of the Channel service steamers was described in the remarks by Mr. Buckwell as being very effective. In this system the vitiated air is drawn into an annular space around the main funnel, this space is divided vertically, the one portion being used for ventilating the forward part and the other the after part of the ship. Another system was referred to in which the foul air is drawn by artificial appliances from the various parts of the ship and discharged into the funnel, thus providing ventilation, and forced or induced draught at the same time. The extraordinary disregard which is paid by many to the loss of coal involved in uncovered steam pipes, boilers, and other portions of the machinery, was commented upon; also the want of thought displayed in arranging the ventilators in steamers without regard to the scientific principles which are based upon the laws of nature. It was suggested that the various ideas brought forward in the paper read, and the discussion to which it has given rise, should be embodied in a future paper and brought into some practical issue.

The Chairman in closing, intimated that some very interesting letters had been received recently from engineers resident in various countries abroad, who were desirous of joining the membership; he also announced that a handsome subscription for the library had just been received from a member on his arrival at Birkenhead from South America. The proceedings closed with the usual vote of thanks.

## MARINE ENGINE GOVERNORS.

By MR. J. D. CHURCHILL.

(Paper read before the Institute of Marine Engineers.)

(Concluded from last number.)

SOME engineers maintain that triple-expansion engines "being so well balanced," do not require Governors. Now it appears to the writer that this is an idea that has been adopted without due consideration, and he hopes to prove the argument untenable.

So far as the writer can learn from these gentlemen, the balancing consists in the engines having three cranks, thus giving a more uniform turning moment to the crank shaft than in the compound engine. No one will deny that the three cranks may balance each other, but *there* the balancing ends, for as soon as you get away from your cranks the unbalancing commences: first of all in the weights of the pistons:—the L.P. being from four to six times the weight of the H.P.: then, secondly, there is frequently a very large discrepancy in the power developed by the respective cylinders, which fact seems to have escaped the notice of the disbelievers in Governors.

Of course, this statement may be met with the remark that such ought not to be the case. It is admitted that *it ought not to be*, if it could be avoided, but it cannot be denied that through some cause or other this is invariably the case.

The writer originally intended to have got together as large a number of indicator cards as possible, and from them to have worked out the indicated powers, but on further consideration it occurred to him that he might be charged with selecting only those cards which would support his line of argument. To avoid anything like a suspicion of this he turned to the technical journals for information, for authoritative information, and there can be no question of incorrectness, the articles having been prepared by those who knew exactly what they were writing about, thoroughly competent men, who have undoubtedly presented to us the best phase possible of their respective engines.

The writer has referred to all the accounts he could find in these papers of the trial trips of a number of steamships fitted with triple-compound engines, and finds that the discrepancy between the power developed by the cylinder doing most work and that doing least in any one engine is not less than 34.02% on the average. The analysis of these discrepancies is very interesting.

On reading this paragraph over to an engineer the writer was met with the reply:—"The L.P. generally indicates more than the H.P. because of the pumps." This led him to analyse the cases in question, with results as follows, which are scarcely in keeping with the explanation given:—

H.P. is highest in 33% of the cases.

I.P. " " 16.66% " "

L.P. " " 50% " "

On further analysing this the writer finds that the

H.P. is highest and L.P. is lowest in 33.33% of

Int. " " H.P. " " 16.66% of

L.P. " " H.P. " " 33.33% of

L.P. " " Int. " " 16.66% of

These discrepancies, it must be borne in mind, have all appeared when the engines have been working under the most favourable conditions, and when in the hands of the most skilful men, working under the closest supervision of those interested in obtaining the best results. When these engines are put to their ordinary work these discrepancies come out very much heavier. The best engine included in the group giving the above average only showed a discrepancy of a little over 10% in the published report of her trial trip, but the writer has seen numbers of her cards under ordinary working conditions, and finds that the difference is never less than 23%.

In the trial trips report 71.42% of the cases show a discrepancy of 25% and upwards, and 21.42% show discrepancies of upwards of 50%. It is a remarkable fact that not one of the engines referred to in the reports on the trial trips is anywhere near being balanced, and some of them in ordinary work show more than double the difference indicated on the trial trip.

The writer considers the above figures pretty well dispose of the theory of perfect balancing, which is so frequently referred to in contravention of facts, and fully proves the fallacy of ignoring Governors, on this ground, at any rate.

Not long ago a friend of the writer's was in treaty with a well-known engine builder for a pair of triple-compound engines. When they came to the question of Governor, the builder assured the intending purchaser that he built engines strong enough to stand any amount of racing.

The writer, to convince his friend that the statement was not true, took the trouble to hunt up the breakdowns of engines built by these particular builders. It is certain that they would not like the writer to reply to their ad-captandum statement by publishing the list, which contains a good round "baker's dozen" within a very short period.

There is a proverb about those who live in glass houses, &c. The engine that cannot break down has not yet been built.

During the last eighteen months the writer has received particulars of 217 accidents to cranks, screw shafts, and propellers at sea. This number is exclusive of fractures and other defects found out in port and repaired. Out of the number 127 were broken shafts, in every one of which the safety of the ship, and the lives of the crew and passengers, were more or less imperilled. The cases referred to, doubtless, only form a minor portion of the total accidents.

Besides these, there are numbers of screw steamers missing every year with all on board, and the writer is supported by competent authorities in the opinion that the major, or at any rate, a very large portion of these have gone to the bottom through accidents similar to that which occurred to the s.s. *Danmark*, where the broken shaft pounded a hole through her bottom. Doubtless, all have heard of many very narrow escapes from similar causes in which they have only just had time to get the bulkhead doors closed and so save the ship.

It is hoped that the facts set forth in this paper prove the necessity of having a thoroughly efficient Governor, properly fitted, and continuously running. Of course, it is impossible for a Governor to prevent breakdowns, but when they unfortunately occur the effects are minimised.

The following is an extract from a letter received from a well-known engineer:—"The non-fitting of a Governor is a piece of culpable negligence;" expressing an opinion in which all interested in steamships should fully concur.

The writer trusts he has succeeded in bringing forward and establishing many reasons why Governors should be fitted. Many of these reasons he has never heard referred to in discussing the question, and can only conclude that they are not generally known. If these facts cause Governors to be considered as necessary permanent attachments for marine engines he will feel that his work in preparing this paper on "Marine Engine Governors,—Beneficially Considered," has not been spent in vain, and trusts the future will prove that he has, if only in a small degree, contributed something to the comfort and safety of those at sea.

### LAUNCH OF A TORPEDO GUNBOAT.

THE Government of Chili, some three or four years ago, decided that it was necessary for them as a maritime power to increase their Navy by the addition of a number of vessels of the more modern types, it being of the utmost importance to them to be able always to keep their communications along their coast open, as, from the nature of the country, there are many of their large towns which are almost unapproachable by land, and whose supplies in every way depend on the communication by sea. A commission was therefore appointed, under the presidency of Rear-Admiral Latorre, and sent to Europe with a view of entering into contracts for the vessels required. These comprised one very powerful armour-clad ship, two swift cruisers, and two powerful torpedo gunboats of the *Rattlesnake* class.

Designs and tenders were received from most of the principal shipbuilders both in England and on the Continent, and the order for the two gunboats was placed with Messrs. Laird Brothers, their design having been selected. The first of them was launched on February 9th, and will be followed by the second in two or three weeks; and, the machinery for both being quite ready to go on board, it is expected they will make their trials in a few weeks.

These vessels are an enlarged edition of the *Rattlesnake*, which has shown herself, from her performance through the Manœuvres of 1888 and 1889, to be a most useful adjunct to the Fleet, and which, as is pretty generally known, was built by Messrs. Laird.

The design is one that combines the seaworthiness of a first-class gunboat with the speed and formidable armament of a torpedo boat, but will provide all the habitability in which these craft are so deficient. They are large enough to undertake distinct independent operations, or, when in concert with the combined fleet, to act as scouts, and especially with a view to destroying torpedo boats of the enemy before they can come within range of the fleet to use their torpedoes effectively.

The dimensions are:—Length over all, 240 ft.; breadth, 27 ft. 6 in., with a maximum draft of water 9 to 10 ft.

They will be fitted with two pairs of triple-expansion surface condensing engines, with four boilers of the locomotive type, and, when working under forced draught, will be capable of exerting 4,500 H.P., with which a speed of 21 knots is expected.

The armament will consist of Hotchkiss three 14-pounder and four 3-pounder quick-firing guns, two of the former being arranged on the fore-castle so that they both fire right ahead; the third on the poop, at the after-end, commanding a range

right round the stern; also two 5-barrelled Gatling guns, placed in a commanding position on the top of the pilot tower.

The torpedo armament consists of five torpedo guns, one fixed in the bow and the other four on the broadside, arranged to give a considerable angle of training.

The general construction of the hull is designed to give the greatest possible security in the event of local damage, being subdivided into about 38 separate watertight compartments.

A middle line bulkhead divides the two engine-rooms, and each set of boilers is in its own compartment.

For the length of the machinery space watertight steel bulkheads extend from the bilge to the gunwale, at about 4 ft. from the side of the ship, forming the coal bunkers; and, in addition, the thickness of the steel plating of the sides above water has been increased to 1 in., giving, with the coal bunkers, very good protection against the fire of smaller quick-firing guns.

Good freeboard at the ends, very essential in this class of vessel when being driven fast in a seaway, and a high platform for the bow and stern guns is secured by topgallant fore-castle and half poop, which also increases the space available for accommodation—this, both for officers and men, will be ample.

The vessel is fitted throughout with electric light, and will also have a powerful 25,000 C.P. search light.

The vessel launched on February 9th was named *Almirante Lynch*, by Senora de Orrego L., wife of the Secretary of the Chilean Legation, resident in London, who came down on purpose to perform the ceremony.

Admiral Latorre, who came over from Paris for the occasion, and also to make a thorough inspection of the vessels, is an officer of very distinguished record in the Chilean Navy, having been in command of several vessels during the late war with Peru, and notably the *Almirante Cochrane*, in which vessel he captured the armour-clad turret-ship *Huascar*, after a most determined encounter on the coast.

The latter vessel has special interest here, as she was designed and built in 1865 by Messrs. Laird Bros., and was at that time one of the most powerful armour-clad men-of-war.

Captain Fernandez, V., of the Chilean Navy, under whose superintendence the vessels have been built, was also present, as well as Senors Astorga and Olivarez, engineers of the Chilean Navy.

Mr. T. Cockbain, Chilean Consul in Liverpool, was represented by his son, and amongst other ladies and gentlemen present were Mr. George Brownell, Mrs. and Miss Brownell, Mrs. and Miss Cockbain, Colonel Cabassa, Captain Scott Brown, Mr. Ibarra, and other officers of the battle-ship *Almirante Brown*, of the Argentine Navy, and Mr. S. R. Platt, of Oldham.

After the launch, the company adjourned to the office, where in the usual way success to the vessel was proposed, and Admiral Latorre in responding, expressed his confidence that the vessel would fully carry out the performance proposed for her.

### EXPLOSION ON BOARD H.M.S. "BARRACOUTA."

NOT for many years, in fact not since the explosion on board H.M.S. *Thistle*, has such an accident happened as that which occurred on February 8th last, at the steam trial of the *Barracouta*. This was the third occasion on which she had left the harbour for her steam trials. The first time her steering gear gave no end of trouble, and after nearly running into a schooner outside the harbour, she was brought back to Sheerness. After the dockyard authorities had worked day and night for nearly a week making good the defects in her steering gear, she again on February 6th proceeded to sea for another trial, but after an absence of about an hour she returned to harbour, the trial having to be postponed through a leakage in the joints of her cylinder cover.

On Saturday, February 8th, at seven o'clock in the morning, the *Barracouta* left Sheerness Harbour for the third time to resume her trial, which it was decided should be of eight hours' duration. The engines were in charge of representatives of the contractors (the Palmer Shipbuilding Company, of Jarrow-on-Tyne), and a number of dockyard and naval officials were present to witness the trials. The ship was put upon her eight hours' trial about half-past seven, and all went well until she was off Margate, when a shocking accident occurred in "

port stockhold. Flames issued in great volume from the furnaces, causing the men to beat a hasty retreat into the engine-rooms. The boilers at the time were working at a pressure of 150 lbs., and half-an-inch of air pressure was used with the fan engines. As soon as the flames and smoke had subsided, it was found that ten men were injured, three of them being in the employment of the contractors, three were dockyard men, and four were sailors belonging to the Royal Navy.

The cause of the catastrophe was of course unknown, but it was thought to be due to the sudden expansion and contraction of the tube-plates, which thus caused an escape of water and steam in the fire-box forcing the flames out of the furnaces into the stockhold.

The pressure of steam was immediately reduced in the boilers, and the *Barracouta* headed back for Sheerness, signals being made as soon as practicable to the Garrison Point Fort for cots and medical assistance. The poor men suffered dreadful agonies from their burns, but Dr. Mansfield, surgeon of the *Wildfire*, who was on board, was unremitting in the use of the means at his disposal to alleviate their sufferings. On the vessel's arrival in harbour seven of the injured men were removed in a steam tug to Melville Hospital, Chatham, and one was brought ashore to the sick bay at the Royal Naval Barracks, where he died the same night.

As the port boiler was used by the ship on her return voyage to Sheerness, and worked well with a pressure of 75 lbs. of steam (half of the pressure at the same time when the accident occurred) it would seem to negative the idea that the boiler has received any serious injury.

The *Barracouta* was brought by Government tugs into the steam basin of Sheerness Dockyard and berthed alongside the mast shears. When the boiler cooled down an inspection was made by the dockyard authorities, after which the stockhold doors were sealed, and sentries posted to prevent persons from having access to them. The examination lasted some hours, but the conclusions arrived at were kept strictly private, and will be embodied, in the first instance, in a confidential report to the Admiralty.

### AUSTRALIAN CRUISER "PERSIAN."

ON February 5th there was launched from the yard of Armstrong, Mitchell & Co., Elswick, the cruiser *Persian*, one of five vessels being built for the Australian colonies, and intended for the protection of the commerce of Great Britain and the colonies in antipodean waters. The new cruiser is 265 ft. between the perpendiculars; her extreme breadth is 31 ft., and with a mean draught of 15½ ft. her displacement will be 2,575 tons. She will be fitted with twin screws and vertical triple-expansion engines capable of developing 7,500 H.P. under forced draught, and 4,500 I.H.P. with natural draught. The engines are being made by Messrs. Hawthorn, Leslie & Co., Newcastle-on-Tyne. The ship will, it is anticipated, realise a speed somewhat exceeding 19 knots during a continuous trial of four hours' duration, and with 4,500 I.H.P. a speed of about 17½ knots during a twelve hours' trial. She will carry 300 tons of coal, which will enable her to steam 6,000 knots at a 10-knot speed. Her armament will consist of eight 12-centimetre (4.68-in.) quick-firing guns, eight 3-pounder quick-firing guns, one 7-pounder boat and field gun, two Nordenfeldt machine guns, and four torpedo tubes. The machinery and all the vital parts of the ship will be protected by an armoured deck extending from end to end of the ship, the sloping parts of which will be 2½ in. and 2 in. thick, and the horizontal portion 1 in. thick. The vessel is provided with a strong conning tower standing on the forecastle. Like her sister ships, the *Persian* is provided with a balanced rudder to allow of rapid manœuvring in action, and is also provided with a strong steel under-water spur for efficient use in ramming.

INSTITUTION OF NAVAL ARCHITECTS.—The annual meetings of this Institution will take place on Wednesday, March 26th, and two following days, in the hall of the Society of Arts, John Street, Adelphi, London, W.C. The annual dinner will be given on 26th, at the Holborn Restaurant, High Holborn, at 7.15 p.m.

### PROPOSED FORTH AND CLYDE SHIP-CANAL.

THE project of constructing a ship-canal between the rivers Forth and Clyde, which has been much canvassed of late, has received all along scant encouragement from Glasgow people; and now, just after the refusal of the naval and military authorities to recommend that Her Majesty's Government should come to the assistance of the promoters, the Glasgow Chamber of Commerce has added another knock-down blow to the scheme. At a recent meeting of the directors of this body the Committee on Home Affairs reported that, having fully considered the subject, they could not recommend the directors to support the memorial of the Edinburgh Chamber as to the proposed canal. They were convinced that such a canal was unnecessary, and that financially it would not be successful. One member, in moving the adoption of the report, said it had been urged that, from a national point of view, it would be of advantage to the country, in the event of a war, to have a deep-water canal joining the Forth and Clyde. Being a national affair, it might, however, very safely be left to the Government to support the scheme or not, just as it thought fit. It did not fall, at all events, to the Chamber to interfere in any way with suggestions to Government on the subject. There was no doubt the scheme was quite practicable, from an engineering point of view, but the real question involved was one of cost, and the amount of traffic to be obtained for the canal after it was opened. After having consulted engineers, he was of opinion that the cost of construction was somewhat under-estimated, and that the traffic to be obtained, on the other hand, was very much over-estimated. He failed to see that there was any great advantage in constructing the canal, because over-sea ships coming either from the south or from the west would save very little time, and might encounter obstacles that were not calculated upon, and which would make it really not worth while encountering the risks of delay, while the Downs, in the south, and the Pentland Firth, in the north, were open to them.

Another member congratulated the committee on its sound judgment, and observed that there were only two parties who could be supposed to advocate such a scheme, and these were engineers and landowners, who would chiefly, if not wholly, alone benefit from it.

The directors unanimously approved of the committee's report.

So far as Glasgow is concerned, therefore, the canal scheme may be considered as practically put on the shelf.

### THE JUNIOR ENGINEERING SOCIETY.

ON Saturday afternoon, February 8th, a large party of members of this society visited the British India Mail s.s. *Taroba*, through the kindness of Messrs. Gray, Dawes & Co. The visitors were received and shown over the vessel by its chief engineer, Mr. Peter Boyd, R.N.R., and his assistant, Mr. Hunter. The greatest interest was naturally concentrated in the machinery, in connection with which the many features calling for particular attention in the main triple-expansion and in the auxiliary, starting, hydraulic and electric light engines were pointed out and fully explained with the aid of drawings. The party afterwards partook of the Company's hospitality on board, and accorded its thanks to all concerned. The opportunity so obligingly afforded by the owners for enabling the manipulation and running of the engines to be witnessed was much appreciated on the following Monday, when a party of members proceeded with the vessel from the Royal Albert Docks to Gravesend. By convenient arrangement each of the visitors entered the engine-room and stokehold for a time, and had the pleasure of observing under the most advantageous conditions the general characteristics in the satisfactory working of the engines and boilers.

THE UNITED ASBESTOS CO., LIMITED.—We understand that this Company have removed their place of business in London from 161, Queen Victoria Street, E.C., to larger and more convenient premises recently occupied by the East and West India Dock Co. Their address now is Dock House, Billiter Street, London, E.C.

## THE INSTITUTION OF CIVIL ENGINEERS.

TWO meetings of this Institute were held on February 4th and 18th. Sir John Coode, K.C.M.G., the president, being in the chair on both occasions. The paper read at the first meeting was on "Bars at the Mouths of Tidal Estuaries," by Mr. Henry Wheeler, M.Inst.C.E. The paper referred to the different kinds of bars, treated of causes of their formation, and suggested remedies for their removal. The views of the author were thus summarised:—(1) That the forces which operated in maintaining the existence of bars in tidal estuaries came from the sea, and were not due to upland water. (2) That the dispersal of bars and the improvement of the outfall channels of estuaries could be accomplished by increasing the volume and velocity of the tidal water passing over the bar, and by giving a greater preponderance to the ebb current. (3) That in designing works for this purpose, the circumstances of those estuaries which had natural deep water channels free from bars should be taken as guides. After the reading of the paper the usual transfers and monthly ballot, etc., took place.

At the second meeting on February 18th three papers were read on waterworks in China and Japan, viz., "The Shanghai Waterworks," by Mr. J. W. Hart, M.Inst.C.E., "The Tytam Waterworks, Hong-Kong," by Mr. James Orange, Associate M.Inst.C.E., and "The Construction of the Yokohama Waterworks," by Mr. J. H. T. Turner, B.Sc., Associate M.Inst.C.E.

### H.M.S. "GOLDFINCH."

AN addition was made to the effective strength of the Royal Navy on February 8th by the completion for foreign service of the new first-class composite gun-vessel *Goldfinch*, which has been built and equipped at Sheerness Dockyard at a cost of £49,000. The *Goldfinch* is an improved gun-vessel of the *Pigmy* type, and has been built from the designs of Mr. W. H. White, Director of Naval Construction. She is the same length as the *Pigmy*, but has an increased beam of 1 ft., which has added 50 tons to her displacement. She was commenced in August, 1888, and launched in May, 1889, so that altogether about eighteen months have been occupied in her construction. She is 165 ft. in length between perpendiculars, 31 ft. in breadth, and has a displacement of 805 tons, and a mean load draught of 11 ft. 7½ in. Her machinery is of the triple-expansion type, and is capable of developing 1,200 H.P. under forced draught, with a speed of 13 knots, and 720 H.P. under natural draught, with a speed of 11.75 knots. She has storage capacity for 105 tons of coal, which is sufficient to enable her to steam 2,500 knots at a reduced speed of 10 knots. Her armament consists of six 4-in. breechloading guns, two of which are mounted on the poop, two on the fore-castle, and two amidships; two 3-pounder quick-firing guns mounted on the main deck under the fore-castle, and an equipment of Nordenfeldts, which can be fired from under the poop or from various other positions on the ship. The *Goldfinch* is commissioned by Lieutenant-Commander Charles E. Kingsmill for service on the Australian station.

## INTERNATIONAL EXHIBITION OF MINING AND METALLURGY, LONDON, 1890.

AN International Exhibition of Mining and Metallurgy on an extensive scale, the result of a proposal which emanated from the *Mining Journal*, will be held during the forthcoming summer at the Crystal Palace, Sydenham. It has received most encouraging and widespread support. The Lord Mayor of London is patron of the exhibition, and the honorary president is the Duke of Fife. The list of honorary vice-presidents includes many distinguished names, amongst them those of the Earl of Wharfedale, Lord Brassey, Lord Thurlow, Sir Frederick Abel, C.B., Sir Alexander Armstrong, K.C.B., &c. Mr. W. Pritchard Morgan, M.P., who has been so closely identified with the revival of gold mining in Wales, presides over the Executive Council, which consists of a number of gentlemen well known in connection with mining, metallurgical, and allied interests; while amongst the hon. members figure the names of scores of gentlemen familiarly associated with the financial, industrial, and

scientific aspects of mining and metallurgical enterprise. The scope of the exhibition will be sufficiently wide to enable a most valuable and interesting display to be made. Immense advances have of late years taken place in mining and metallurgical practice, and no wholly suitable opportunity has presented itself, or been taken advantage of, for adequately illustrating the degree of progress which has been attained. This remark especially applies to metalliferous mining, and to the economical treatment of refractory ores for the recovery of precious metals. Moreover, it will be readily admitted that at no previous period has mining assumed such a degree of importance, whether it be regarded as an industry, a profession, or a vehicle for speculation and investment. A little consideration will suffice to emphasise the impression that an international exhibition of mining and metallurgy, conducted on a sound and independent basis, is not only eminently desirable, but is admirably calculated to promote the best interests of legitimate mining and scientific metallurgy, which now occupy such important positions in connection with modern industrial advancement. It is worthy of note that one-half of the surplus of the exhibition, as certified by the auditors, is to be paid to the exhibitors *pro rata* to the amount paid by them for space occupied, and the other half is to be disposed of by the council, either in founding a scholarship at the Royal School of Mines, or in helping some other institution connected with mining and metallurgy. The exhibition will open on July 2nd, and close on September 30th, 1890, and, besides several features of special attraction, important collections of exhibits are expected from the Colonies and foreign countries. The honorary secretary is Mr. George A. Ferguson, editor of the *Mining Journal*, 18, Finch Lane, London, E.C., from whom prospectuses and application forms for space may be obtained.

CREDITABLE TO TEES-SIDE.—The s.s. *Petrolea*, an oil vessel built by Messrs. Craig, Taylor & Co., Stockton-on-Tees, for Alfred Stuart, Esq., London, and engaged by Messrs. Black, Hawthorn & Co., of Gateshead, has lately made the voyage from Batoum to Trieste and discharged her cargo of close on 3,500 tons in less time than any other vessel has as yet made the voyage in. This is very satisfactory and creditable to the work produced in the district. We understand that Messrs. Craig, Taylor & Co. have another vessel, which will be launched in the course of a fortnight, a sister ship to this.

NEW FRENCH CHALK PENCILS.—We have received from Mr. Geo. G. Blackwell, 25, 26, and 27, Irwell Chambers, West Fazakerley Street, Liverpool, samples of these chalks which he has introduced as a speciality for marking on iron, steel, and other like substances. We have tried them and they seem to answer the purpose very well, making an unmistakably well defined mark.

THE "BARRACOUTA" EXPLOSION.—Mr. T. A. Crompton, of the firm of Crompton, Ullstrom & Crompton, marine engineers, 19, Gracechurch Street, London, has been appointed to sit as assessor with Mr. Harris, the coroner for Kent, on the inquiry re the explosion on board H.M.S. *Barracouta*.

MR. J. H. BILES, naval architect and manager to Messrs. J. and G. Thomson, of Clydebank, for a number of years past—throughout, indeed, the busiest and most important period of that firm's history as constructors of war-ships, and of large and powerful merchant ships—has recently left Clydebank to become general manager of a new shipbuilding concern presently being organised for operations on a large scale at Southampton. The new company, which is styled "The Southampton Naval Works Co., Limited," is a private copartnership, the chairman being Mr. Edward Coates, a well-known London financier, and on the directorate are Mr. Beckett Hill, of the Allan line of steamers, Mr. Thomas Stevenson, Stockton-on-Tees, connected with the steel industry, Mr. J. Wallace Cox, of London, and other gentlemen. Mr. Ernest Gearing, lately superintendent engineer of the Inman Line, has been engaged as manager of the engineering department. Mr. Gearing has had large experience in running war-ships and other steamers, and was chief of the engineering staff in the famous *City of Paris*.

NATURAL gas is now used in 104 steel works in America, but it is said that the supply has latterly shown signs of failure, and that several of the works now using it are thinking of returning to their old fuel.

## NEW AND IMPROVED MACHINES OF THE BRITANNIA COMPANY, COLCHESTER.

**SCREWING MACHINE** (McIlquham's Patent)  
(Fig. 1).—This machine is constructed on improved and very simple principles, greatly advantageous

centring die chuck for gripping rods, tubes, or bolt-heads. A clutch and lever enables the machine to be started and stopped instantly and independently of the counter-shaft. The spindle is driven by a three-speed cone pulley and powerful gearing. The bed is machine-planed, of trough section to catch the soap

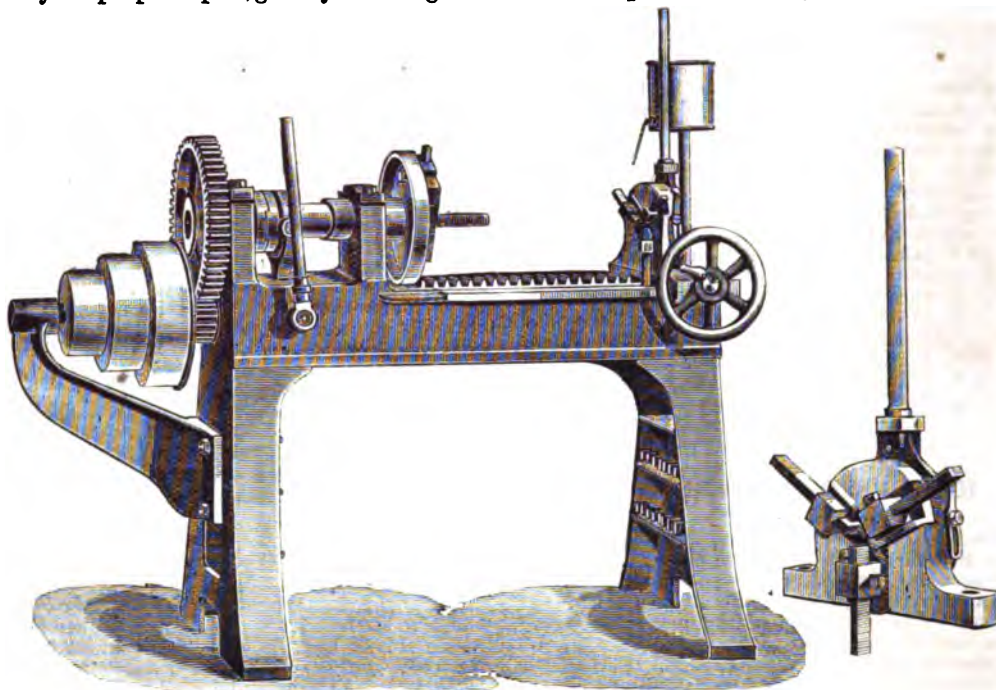


FIG. 1.

to users in point of economy both in working and maintaining in repair.

The headstock is constructed with a hollow spindle to take rods or tubes of any length, and with a self-

and water used in screwing, and is fitted with a tap to draw off. Fitted to the bed is a saddle to slide along, and moved by racks and pinions and hand wheel, which carries the screwing head. This is fitted with three tool boxes, carrying tools similar to ordinary chasers and so constructed as to be held firmly in position by one set screw to each. These are closed and opened by lever and eccentric cam, and the top face of the screwing head is graduated and fitted with a stop to adjust the depth of cut.

**ELECTRICAL ENGINEERS' DRILLS** (Fig. 2).—This illustration represents a gang of four quick speed drilling machines, mounted on a cast-iron base, for rapidly drilling small holes of equal or varying sizes, or counter sinking, reversing, &c. They are driven by counter shaft at back, fitted with one pair of fast and loose pulleys, and a cone pulley for each drill, and are designed to be driven by power. They are made with steel spindles, running in hard steel bearings and fed by hand lever and link motion, with balanced weight to bring up the spindle, the latter having a steel swivel at top. They have turned pillars, with tables to rise and fall, or swivel around.

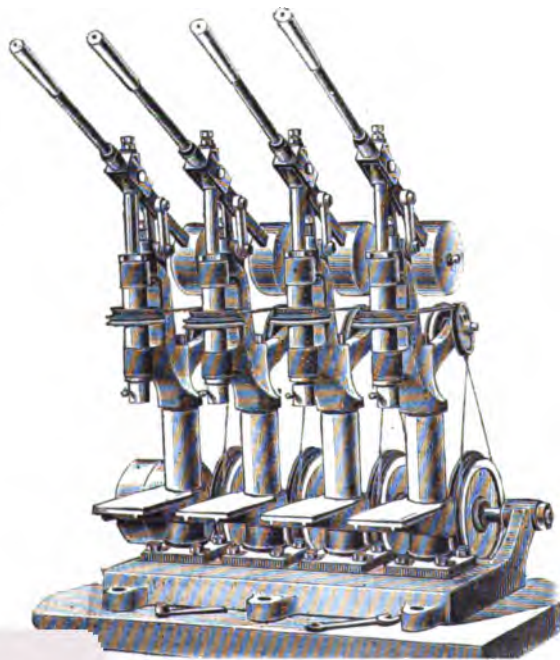


FIG. 2.

**IMPROVED STYLE BENCH DRILLING MACHINE** (Fig. 3).—This is a handy drill for light work; made to drive by hand or treadle or by both, and can also be driven by power if desired. It is constructed with a web-section body, turned to fit on to and swivel around a stiff turned pillar, secured by a nut at any angle and by loosening which the drill can be brought to any position in its

radius, and is thus very handy for drilling holes in large objects. The pillar is cast in one, with a strong foot, to bolt on to the bench, and carries a bracket which swivels on its own centre, giving every facility for adjusting the work bolted to it under the drill. It has two driving shafts, that for the treadle or power running to the back, and that for hand motion to the

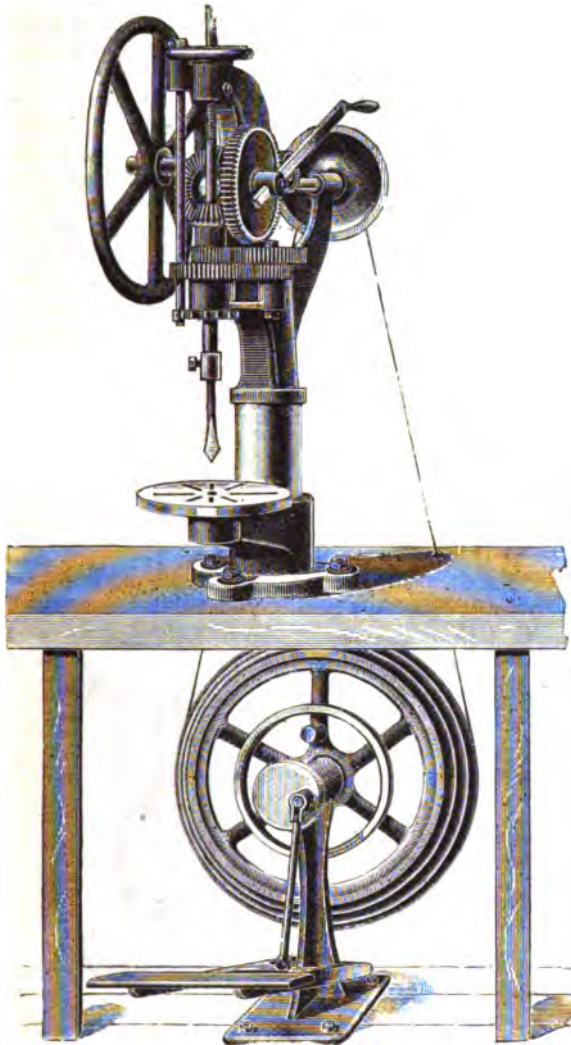


FIG. 3.

right side, and these drive the spindles by bevel and spur gearing. It is constructed with a specially ingenious contrivance of spur gearing in combination with a fly-wheel, which gives immense impetus to the motion, and greatly facilitates the work. It has also single and double gearing for small and large holes, and has both self-acting and hand-feed. The treadle driving gear is made independent of the machine, to fix under the bench, the wheel having four speeds to drive the speed cone fitted to the driving shaft, thus giving, with the double gearing, eight changes of speed.

Large harbour extensions have been decided upon at Stettin; the Germans are not in the habit of doing things by halves, and the cost of the above works is expected to amount to some 6,000,000 marks, or £300,000.

## THE ELECTRIC MERCURIAL THERMOSTAT.

THIS is an automatic-acting instrument for indicating variation of temperature in the refrigerating chambers, bunkers, and other holds of steamships, and is

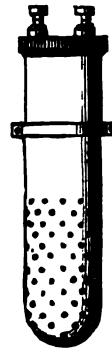


FIG. 1.

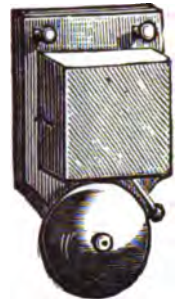


FIG. 4.

specially valuable on board those engaged in carrying meat, &c. In each refrigerating chamber a thermostat enclosed in a strong brass cylinder (Fig. 1) is placed, set to a required degree; for instance—for meat, at

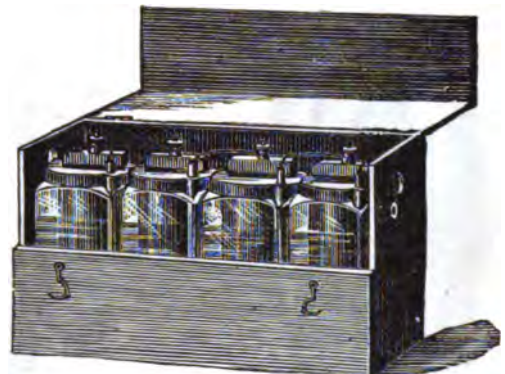


FIG. 2.

freezing point; for fish, at 10 degrees; for fruit, at 20 degrees; and so on. All these are connected with an electric battery (Fig. 2) and to an indicator (Fig. 3) provided with a continuous-ringing bell (Fig. 4), and

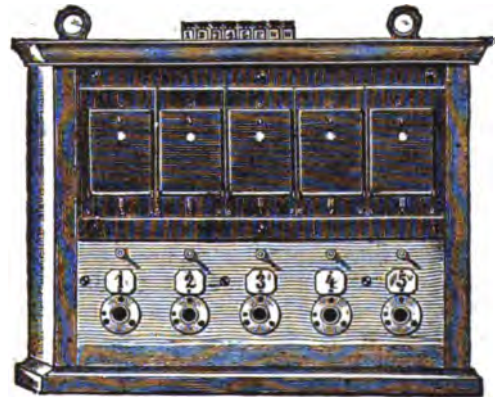


FIG. 3.

to prevent the possibility of a breakdown in efficient working, a second or spare battery is provided, which, in the event of anything going wrong with the one in use, can be immediately connected with the ther-

mostat and indicator by a switch (Fig. 5) provided for the purpose. The indicator is fitted in the chief engineer's cabin, and immediately the temperature rises in any of the various compartments, the bell



FIG. 5.

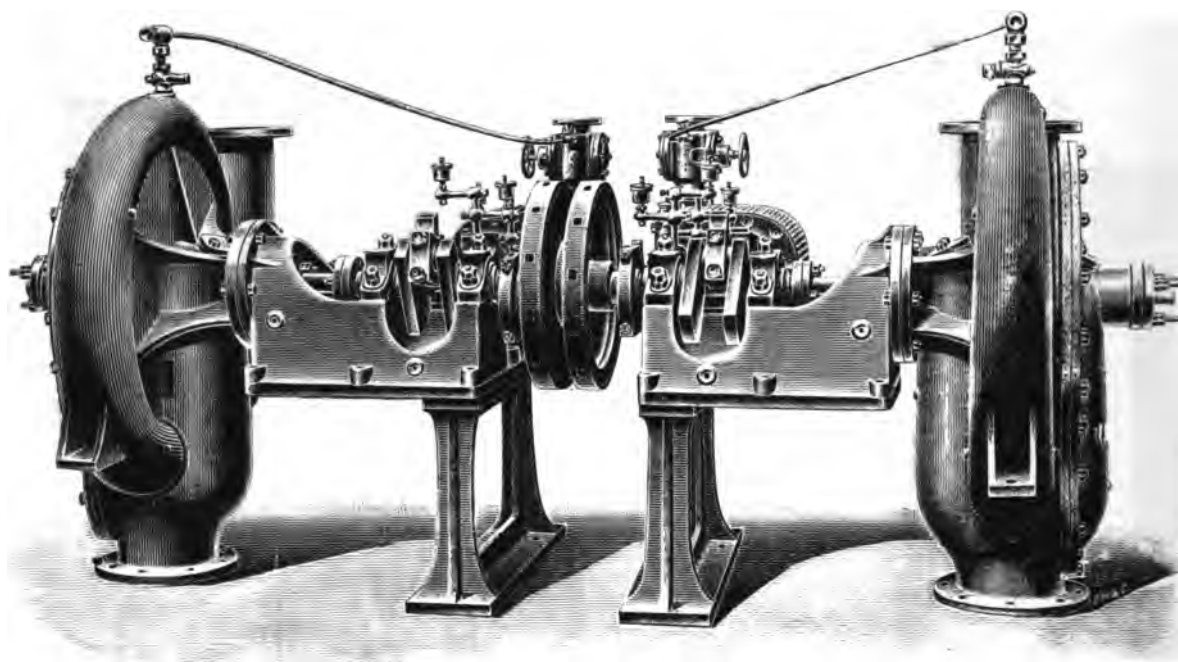
commences to ring, the indicator denoting in which compartment attention is required, and it goes on ringing till the temperature in the indicated compart-

## PULSOMETER ENGINEERING CO., LIMITED.

### PAIR OF 10" CENTRIFUGAL PUMPING ENGINES.

OUR engraving represents a pair of 10" centrifugal pumps, with horizontal direct acting engines, arranged to work together or separately, constructed by the Pulsometer Engineering Co., Limited, Nine Elms Iron Works, London, S.W., to the order of a foreign Government for emptying one of their docks, the lift will be about 25 feet.

The pumps are on the company's improved style, the discs can be moved without breaking the joints of the suction or discharge pipes, and they take in their suction on each side of the disc, thus avoiding all unnecessary friction. Hand holes are provided at the top of each suction branch to facilitate the removal of any foreign material which may be drawn into the pump. The crank shaft, connecting rod, and piston of the engines for driving the pumps are made of the best forged steel, whilst the engines are perfectly



ment is reduced to that at which the thermostat has been set. The indicator is thoroughly automatic in its actions, and can be thoroughly relied upon to indicate any neglect of duty by those in charge. This is a very great improvement, and not only prevents the articles in the refrigerating compartment from being spoiled, but saves the officers in charge the trouble of hourly raising or lowering a thermometer, as at present is the case, in the tube provided for that purpose—a duty neither pleasant nor easy during a storm. The sole manufacturers and patentees are Messrs. H. Binko & Co., electrical engineers, 34, Leadenhall Street, London, E.C., who, as is well known, have made ship signalling a speciality for many years, and have fitted over 100 steamships belonging to the principal shipping companies.

balanced, so that they can be run at any speed without the slightest vibration. The lubricating arrangements have also been carefully attended to, and designed so that all the parts may be properly lubricated whilst the engines are running at high speed, and the workmanship throughout is of the best possible description. This class of machinery is specially suited, amongst its many applications, for salvage work and use on board ship for circulating water in surface condenser, emptying water ballast tanks, pumping from bilges, &c., and can be arranged to empty the bilges and water tanks at the same time as it is circulating, and in the case of leakage a large volume of water can be discharged from the vessel without interfering with its efficiency as a circulating pump. Where space is an object the engines can be made vertical, and they can be made compound or condensing if required.

## DOWNIE'S PATENT HIGH-PRESSURE AND PISTON VALVE RING.

**T**HIS packing is formed of one or more concentric rings fitting each other perfectly. From our illustrations it will be seen from Fig. 1, which shows inside elevation of wedges and locking-bars of Double Ring

ment as well as a section of locking-bar through the line A B.

The idea of these rings originated from the complainings and heart burnings experienced by engineers in general, who have tried all sorts of spring pistons for high-pressure steam, and who have had in many cases to go back to a solid piston as the safest under the circumstances. This packing claims to fill the

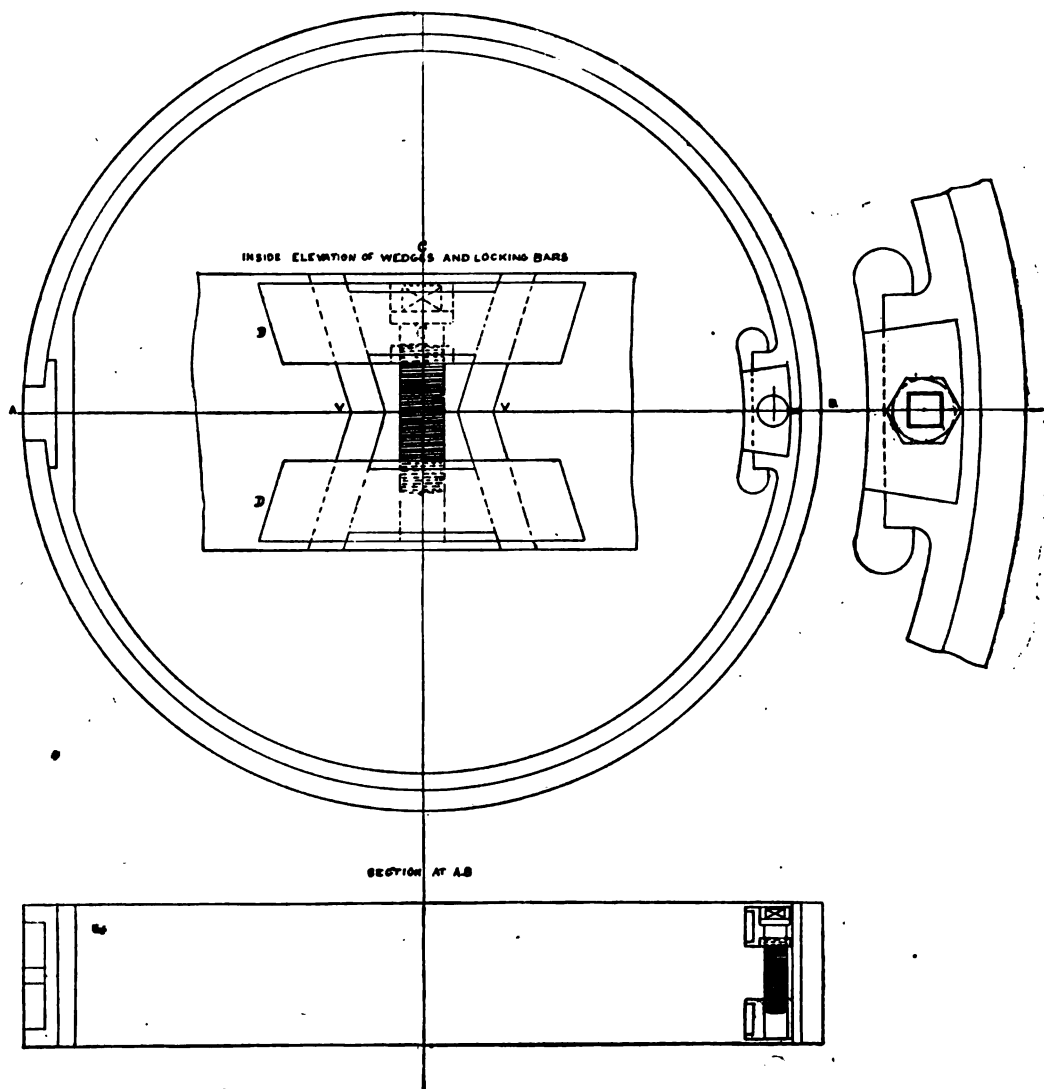


FIG. 1.—Double Ring Arrangement.

arrangement, and also section at A B, that the diameter is acted upon by two pads sliding upon a V slide, cast on the inner side of the ring. On the outside of these projections and moving with the V pads, are the locking bars D, the whole being moved by the screw C. The result is that after the ring has been adjusted to the chamber, the whole arrangement is locked in such a way that the steam-pressure cannot affect it either internally or externally—it is in fact an adjustable plug. Fig. 2 shows the inside and outside elevations of wedges and locking-bars of Single Ring arrange-

ment better than a solid plug, as it is impossible to turn the latter an exact fit to the cylinder, or keep it so for any length of time, even if that were possible. The advantages claimed for the rings are—simplicity, few parts, easy removal, and equal expansion, the rings having no flanges; no springs, consequently no friction, and being adjustable they can be made to fill the chamber perfectly. The patentee is Mr. Thos. Downie, of Liverpool, and the makers, Messrs. H. & C. Grayson, shipbuilders' engineers, &c., 172, Regent Road, Liverpool.

### NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from January 25th to February 24th, 1890:—

Baker, Alexander, engineer to the *Undaunted*, to date February 18th.  
 Ball, Ralph H. C., assistant engineer to the *Colossus*, undated.  
 Bennett, David, engineer to the *Phaeton*, to date February 10th.  
 Burnett, Wm. C., engineer to the *Indus*, additional, to date March 19th.  
 Davis, Fredk. C., assistant engineer to the *Crocodile*, to date February 15th.  
 Gedge, Henry A., assistant engineer to the *Warspite*, to date February 14th.

Lashmore, Harry, assistant engineer to the *Mercury*, to date February 18th.  
 Leahy, Wm. P., assistant engineer to the *Colossus*, to date February 19th.  
 Madge, Henry A., assistant engineer to the *Asia*, supernumerary, to date February 19th.  
 McGregor, Wm., assistant engineer to the *Victoria*, to date February 15th.  
 Main, Fredk., assistant engineer to the *Victoria*, to date February 15th.  
 Martell, Richd. W., probationary, assistant engineer to the *Crocodile*, to date February 17th.  
 New, Thos., chief engineer to the *Phaeton*, re-commissioned, undated.  
 Norrington, Edwd., staff engineer to the *Undaunted*, to date February 18th.  
 Norris, C. M'K., engineer to the *Terror*, additional, to date February 1st.

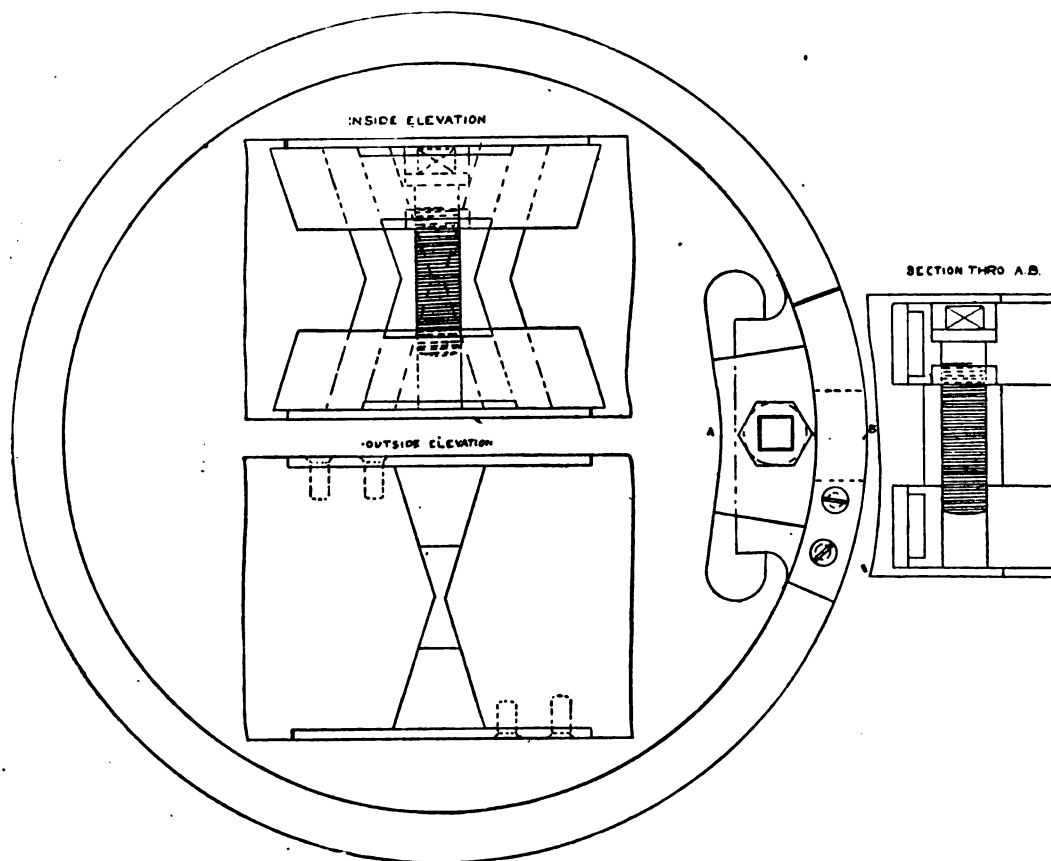


FIG. 2. Single Ring Arrangement.—For description see page 497.

Griffin, Daniel, chief engineer to the *Ranger*, re-appointed on promotion, to date January 19th.  
 Guyer, Thos. L., assistant engineer to the *Audacious*.  
 Herbert, Robt. K., engineer to the *Mercury*, to date February 18th.  
 Hinks, Fredk. H., assistant engineer to the *Undaunted*, to date February 18th.  
 Humphreys, Henry, engineer to the *Warspite*, to date February 14th.  
 Jackson, Thos. B., assistant engineer to the *Undaunted*, to date February 18th.  
 James, Wm. H., assistant engineer to the *Colossus*, undated.  
 Johnson, Jno., fleet engineer to the *Black Prince*, to date February 15th.

Odham, Edward K., engineer to the *Goshawk*, to date March 19th.  
 Osbourne, Chas. E. H., assistant engineer to the *Phaeton*, recommended, undated.  
 Paterson, Geo. T., assistant engineer to the *Warspite*, to date February 14th.  
 Pearce, Wm. W., assistant engineer to the *Mercury*, to date February 18th.  
 Rampling, Henry J., acting chief engineer to the *Grasshopper*, to date February 27th.  
 Robins, Samuel J., staff engineer to the *Mercury*, to date February 18th.  
 Rodet, Ernest W., assistant engineer to the *Warspite*, to date February 14th.

Rule, Thomas, chief engineer to the *Defiance*, additional, to date February 15th.  
 Spalding, Andrew, staff engineer to the *Warspite*, to date February 14th.  
 Stribling, Wm. S., chief engineer to the *Perilous*, to date February 15th.  
 Turner, Arthur W., engineer to the *Colossus*, undated.  
 Walsley, Chas. A., staff engineer to the *Colossus*, to date February 19th.  
 Watch, John L., chief engineer to the *Rattlesnake*.  
 Webb, Arthur T., engineer to the *Defiance*, to date February 10th.  
 Whebly, Thos, engineer to the *Tamar*, to date February 19th.  
 Weeks, Geo. H., staff engineer to the *Goshawk*, additional, re-commissioned, undated.  
 White, Wm. W., chief engineer to the *Racoon*, to date February 15th.  
 Whitmarsh, Alfred, probationary assistant engineer to the *Phaeton*, re-commissioned, undated.  
 Wright, Wallace, assistant engineer to the *Warspite*, to date February 14th.

## HOAR & BROWN'S HARDWOOD MARKET REPORT.

TRAK.—The stock at the early part of the month was :—  
 9,940 Loads Timber.  
 1,676 „ Planks.  
 56 „ Blocks.

Total 11,672 Loads.

These figures are in excess of those quoted in last month's report, but the increase consists largely of inferior timber, and the market price for good stocks has not suffered.

The deliveries continue good, and with regard to the future, the fact that several cargoes for early arrival have been sold away from London will have the effect of strengthening the market.

MAHOGANY.—Small and inferior logs have fallen in value, as anticipated, whilst larger wood, which is daily becoming more scarce, is very firm. A cargo of good average sizes would realise long prices and find a ready sale, as the various contractors want the wood to supply the large orders for railway panels, which have lately been placed.

The position of the Honduras market has been strengthened by the delay in the arrival of the cargo per *s.s. McGarel*, consisting of about 1,000 tons.

The prospects of the market are decidedly encouraging to importers.

CEDAR.—The stock has been changing hands extensively, but very little has gone into consumption.

Importers have appeared anxious to clear their stocks at low prices, and now most of the best parcels are held by the dealers.

AMERICAN WALNUT.—Good prices are being obtained for logs in consequence of stocks having run low, but the importation of inferior parcels, if continued, will soon have the effect of lowering prices again, as the demand is not excessive. Imported boards and planks are finding favour largely, and business is brisk.

AMERICAN OAK.—Although a large volume of business has been done lately, parcels generally are said to have changed hands at low figures.

SEQUOIA.—A clearance of landed stock has been made by forced public sale, with the result usually attending this step, viz., low prices. Purchasers will be more careful in buying cargoes afloat, and speculation in this wood is likely to be very restricted.

AMERICAN ROCK ELM.—The stock is now reduced to small compass, and holders of good parcels are exceedingly firm in their ideas of prices.

GREENHEART.—There is nothing to report beyond the sale of a few logs. The stock is only 73 logs.

General business in the new year cannot so far be considered to have come up to the expectations formed at the close of 1889

## INDUSTRIAL AND TRADE NOTES.

### THE CLYDE AND SCOTLAND.

WHILE there is still no lack of work on hand in the Clyde shipbuilding and engineering works, the slackness in the matter of new orders, which was subject of remark in our last month's Notes, has become more and more accentuated. There is, indeed, almost an entire absence of enquiry, so much so that one of the largest Clyde builders declares he never remembers so complete a collapse in this connection. There are fortunately contracts booked sufficient to keep all departments busy for several months to come, but some of the smaller firms are within measurable distance of a termination to their present contracts. On the whole the dearth of new orders is not matter for very great regret, as it is likely to result in a prolongation of the period of activity—although not at the same high-pressure rate which has prevailed for many months past. In well-informed quarters the belief is entertained that orders are being held back until the future course of the warrant market is disclosed, and in the hope that makers' prices will get easier.

As showing the productive capabilities of the Fairfield shipbuilding and engineering works, it was stated by the managing director, Mr. Richard Barnwell, at a festive gathering of the Fairfield staff, held in Govan, on the 1st February, that they had commenced the year with work on hand of about 41,000 tons of shipping, and 65,000 H.P. of engines, and the instalments to be received on this work during the year would be about 1½ millions sterling. This exceeded the highest total hitherto produced in the works during one year—in 1883, when the tonnage was 40,115 tons, and the H.P. 56,995. The fulfilment of the promises made to their clients, to deliver this great amount of work, depended upon their staff and workmen, and the company looked for their best aid. It would be a great achievement of which they might all feel proud, and one which with unanimous determination and harmonious effort was not beyond their capabilities.

At Dumbarton, Messrs. Denny Bros. continue to be fully occupied, work on the two important Union Liners being now begun. This firm, and their *confrères* in the engineering branch, Messrs. Denny & Co., have been kept busy by their staunch customers, the British India Steam Navigation Co., and Messrs. Patrick Henderson & Co., in the refitting of steamers of their fleet with passenger accommodation, and with engines and boilers (new or converted) on the quadruple-expansion principle as patented by Mr. Brock, of Denny & Co. The *Africa*, of the British India fleet has just been completely re-engined and refitted, and the same Co.'s steamer *Ethiopia* is presently undergoing similar treatment in Messrs. Denny's docks. The steamer *Canara* and the *Goa*, also belonging to the same company, are about to be put into the same hands, for new engines and boilers and general improvement and overhaul—all of which means a large amount of employment for the workmen of both firms.

The erection of the new steel Works by the Dumbarton Steel Co., is proceeding apace, but when started, the company propose confining for a time the manufacture of material to the demands of the Dumbarton firms only. Messrs. Hardie & Gordon, iron and brass founders, are about to add to their premises a new building, 146 ft. long by 75 ft. broad, to be used as a moulding shop, and an oven for the gradual cooling of castings.

At Messrs. Russell & Co.'s Port-Glasgow and Greenock shipbuilding yards all the fourteen slips are occupied, and there are orders for new vessels to be laid down on several of the slips as soon as they are empty. This would seem to indicate that this year's output of new shipping by Messrs. Russell & Co. will be quite up to the high level reached last year. The growth of this firm's shipbuilding business during the past dozen years or so has been quite phenomenal. In 1876 the output was only 2,446 tons, while in 1884 it had risen to 32,120 tons, and to 40,866 in 1885. In 1886 and 1887 there was a falling off, as was the case generally on the Clyde, but in 1888 the output reached the extraordinary total of 45,495 tons, and last year the still higher figure of 46,500 tons.

Messrs. Scott & Co., of Greenock, who occupied fourth place in the output list for last year, with a tonnage of 20,630, are now not so busy, but they anticipate to be favoured shortly with extensive orders from their staunch customers, the Mala Real Portuguese Co. Since June last Messrs. Scott have constructed for this company as many as five steamers, the last ?

*Malange*, which ran her trial trips satisfactorily in the early part of the month. It is not very often that a shipbuilding firm has the satisfaction of building so large an amount of tonnage for one company in so short a time.

Messrs. John Reid & Co., shipbuilders, Port-Glasgow, one of the oldest firms on the Clyde, have been obliged to suspend payment. At a largely-attended meeting of their creditors, held in the chambers of Messrs. McFarlan, Hutton & Patriok, Glasgow, on the 3rd February, it was resolved to realise the estate by a trust deed in favour of Mr. Hutton, with a committee of the principal creditors to advise. The state of affairs showed liabilities amounting to £103,765 7s. 10d.; and assets—embracing shipyard, shipping shares, sundry heritable property, machinery, and stock, balance due for work in progress, &c.—stated at £112,887 11s. 9d., thus giving an apparent surplus of £9,122 3s. 11d. This, however, is subject to contingencies on completing contracts, realization of heritable securities, and other assets, and the adjustment of claims.

Messrs. Fleming & Ferguson, the enterprising Paisley firm of shipbuilders, engineers and dredgebuilders, have supplied within the past 14 months as many as 10 sets of their patent quadruple-expansion engines and boilers to new vessels built for the late Thomas A. Walker, the contractor for the Madero Port Works at Buenos Ayres, and they have at present on hand other two similar sets for Mr. Walker's executors. Eight of the vessels fitted with these engines have already made the voyage to Buenos Ayres, and are now in constant service there, and giving the utmost satisfaction. As certified by the executors of Mr. Walker, the coal consumption in these vessels is remarkably low. The amount consumed on the voyage to Buenos Ayres, with the vessel fully loaded, averaged 112 lbs. per 100 H.P. per hour—equivalent to the extremely low figure of 1.12 lbs. per H.P. per hour. Besides economy in consumption, this type of engine (which was fully described and illustrated in our issue for October last) is most economical in space, simple in construction, and easily accessible. The smoothness and noiselessness with which it works is another conspicuous feature of the engine, and the executors report that, "having now had considerable experience of the working and wearing of this type of engine, we think the makers have reduced the cost to a minimum."

A company is being formed to acquire and carry on as a going concern the well-known business of Messrs. P. & W. McLellan, of Glasgow, engineers, iron, steel, metal and timber merchants. This business was established in the year 1811, and is carried on at the Clutha Works, and at the warehouses in Trongate, Glasgow, and also at Great Winchester Street, London. The firm are contractors to the Admiralty, the War Office, the Government of India, and most of the home and colonial railways. The *employes* number about 2,000, and the present annual turn-over is upwards of one million sterling. The firm have contracts on hand sufficient to keep the works going for a year, and the future prospects are very encouraging. The purchase price to be paid for the works, land, buildings, fixed plant and machinery, loose tools, engines, stock-in-trade and furniture, with the goodwill and patent rights, &c., has been fixed by the vendors at £350,000, with a guarantee that the loose tools and stock-in-trade to be handed over shall be of the value of £50,000.

Owners of steamers trading to and from the Clyde, in common with the owners of most other important shipping ports throughout the kingdom, have found of late that the actions of the stevedores result in a very considerable increase of the ordinary cost and charges. Not only have wages been advanced by about 20 per cent., but expenses are increased other 30 per cent. at least, through the indifferent manner in which work is performed. It is asserted that, while the loading and unloading of a steamer costs some 1s. 4d. an hour at Baltimore and other American ports, and on the Clyde only about 6½d. per hour, owners find that the highest charge is the cheapest in the long run, chiefly because of the greater expedition and care shown by the workmen at the out-ports.

There is perhaps no truer index to the state of the shipping trade of Glasgow than the receipts of the Clyde Trust, and all interested in this great trade have reason to feel gratified at the increase in the revenue of that institution. For the first month of this year the receipts amounted to £30,353 5s. 1d., an increase of £3,810 1s. 8d. on the corresponding month of last year, while for the seven months of the financial year there had been an increase over the corresponding period of the previous year of £8,524 18s. 3d. These additions may in themselves appear rather small but they

mean a large increase in the amount of tonnage arriving, and therefore an increased demand for labour in so many different channels that their true value can hardly be properly appreciated. Should the same rate of progress be maintained, the income for the present financial year will have reached its highest point, namely, close on £400,000.

At a meeting of the members of the Trust on the 4th February, the vacancy caused by the retiral and subsequent decease of Mr. George Reith, general manager, was filled up through the election by ballot of Mr. William McKenzie, for the last twelve years law-agent to the Glasgow, Barrhead and Kilmarnock, and the Glasgow and Paisley Joint Railway. Mr. McKenzie, who was elected by fourteen as against ten votes, is about 40 years of age, and has the reputation of being a sound lawyer and an energetic business man. The situation—that of secretary to the Trust—is paid with a salary of £1,000 per annum.

The officials and workmen of the Steel Co. of Scotland, at a *soirée* and concert in the Victoria Hall, Hallside, on 15th February, presented Mr. Alexander Aitchison, the present engineer at the Hallside Works, who leaves shortly for the River Tyne, with a gold watch and albert. The situation which Mr. Aitchison goes to fill is that of superintendent engineer at the Palmer Steel Works, Jarrow-on-Tyne.

## TRADE NOTES FROM THE TYNE, WEAR TEES, HARTLEPOOLS, &c.

### THE TYNE.

**Shipbuilding.**—The outlook for this industry at the present moment is by no means so cheerful as could be wished, as there is nothing like an adequate amount of new work being contracted for, to replace the orders that are being worked off. There is not the slightest doubt that the high prices of tonnage, brought about by the increased cost of labour and material, has put a stop to speculative enterprise, and it may be safely assumed that for many months to come no new vessels will be contracted for, excepting such as are needed for employment in special trades, or to replace losses. Looking at some aspects of the situation, indeed, it would seem reasonable enough to conclude that another era of depression would very shortly be initiated; but there is a feature in connection with the present position of affairs which was not so strongly marked in former times of briskness, and which may tend to keep up a semblance of prosperity for a much longer period than could otherwise have been calculated upon. The feature here referred to is the necessity imposed upon shipowners by the exigencies of competition, to keep on removing from their active service list old and practically worn-out vessels whose propelling power usually consists of engines that must shortly become obsolete, if they are not so already. This process of substitution will doubtless bring a considerable amount of work to the shipbuilders, but the orders are not likely to come until the prices of new tonnage are sufficiently reduced to make this class of property a remunerative investment for capital. In spite of the somewhat unpromising aspect of matters, the workmen still seem disposed to press for advances of wages, the latest application having come from the shipwrights, who request that their present wage of 37s. per week shall be advanced to 40s. The notice is to expire on March 18th, when, unless a settlement is effected in the meantime, a cessation of operations by this section may take place. For some years past, however, all wages disputes in connection with the Tyne shipbuilding trade have been settled by peaceable discussion, and there is, consequently, a likelihood of this question being disposed of without a resort to extreme measures. Messrs. Armstrong, Mitchell & Co. are getting pretty well through with their contracts for oil steamers, and there are already at the Low Walker yard no less than three berths vacant. They are now preparing to launch an oil-carrying steamer of large size, and have five other vessels, in various stages of construction, on the stocks. At the Elswick yard, belonging to the firm, the construction of a number of cruisers, of various sizes, is being actively pushed on, and a large force of hands is employed. At Messrs. Hawthorn, Lealie & Co.'s yard the Russian steamer *Eagle*, which is said to be the largest merchant vessel ever built on the Tyne, is being rapidly got ready for sea, and is expected to be handed over to her owners in the course of a very few days. The vessel, whose engines are on the twin-screw principle—everything in connection with the machinery being duplicated—is expected to attain a speed of 18 knots an

hour. She is an exceedingly handsome model, being built on lines adapted for the attainment of high speed, and her interior fittings are of the most elaborate description. The firm have other vessels of a high class in early stages, and are still engaged with important repair contracts. The war sloop which the firm are building for the Admiralty is nearing completion, and will be put off the stocks in the course of a few weeks. The Palmer's Shipbuilding & Iron Co., Limited, have laid down the cruisers which they were commissioned to build for the home Government, in their Howdon yard, and the construction of the three vessels is now being proceeded with simultaneously. They have several vessels, of an important class, in different stages of building, at their Jarrow establishment, where the preliminary arrangements for the building of two line-of-battle ships are also in progress. Messrs. W. Dobson & Co. have two very large steamers, which, it is understood, are ordered by local owners, on the stocks, and preparations for laying down another are in progress. The firm have also a couple of comparatively small vessels in hand. Messrs. W. Richardson & Co. are preparing to launch a handsomely-finished passenger steamer, and it is understood that they have orders for other high-class vessels in reserve. Messrs. Wood & Skinner who, as stated in last month's report, are making important extensions in their establishment, are also putting down new plant and otherwise adding to their productive resources. Messrs. C. S. Swan & Hunter have orders for two vessels of large size, which it is understood are to form the nucleus of a new line of passenger steamers and they have a considerable quantity of less important work in progress or on order. Messrs. Schlesinger, Davis & Co. have now more berths occupied than they had a month ago, and at Messrs. R. Stephenson & Co.'s establishment signs of fuller work are also discernible. The yard of the Tyne Shipbuilding Co. continues to exhibit its usual briskness, and the yards at Tyne Dock and Shields are still quite full of work. Repair work, which at all times constitutes an important feature in the operations of firms at the two last named centres, has been exceptionally plentiful of late, and is now giving employment to more than the ordinary number of hands.

**Engineering.**—The wages question in the engineering trade may be looked upon as settled, the matter having been compromised by the concession of 1s. per week advance instead of the 2s. asked for. The question of the 12 o'clock stopping time on Saturdays, however, is still in abeyance, and as it involves a departure from the nine hours' system, it is not likely to be disposed of without some difficulty. The local engineering employers, who are as a body affiliated to the Iron Trades Employers' Association, cannot deal with the matter without the acquiescence of the latter, and so far as present appearances seem to indicate, that is not likely to be obtained. The engineering departments of Messrs. Hawthorn, Leslie & Co., and the Palmer's Shipbuilding and Iron Co. were never busier than at this moment, Government contracts forming a large proportion of the work on hand at each establishment. The former firm are now engaged in putting the machinery in the Australian cruiser *Persian*, and the latter have a couple of steamers at the shearlegs receiving their engines, &c., while others are waiting turns to have their machinery fitted when those now in hand are completed. At the whole of the other marine engineering establishments an almost uniformly brisk state of business is maintained. Messrs. Ernest Scott & Co., of the Close Works, Newcastle, have orders for a considerable number of forced draught fans. Specimens of this speciality, varying from 14 in. to 72 in. diam. are now in progress. Fans of the latter size are being fitted with a single-acting engine having the working parts running in a bath of oil. Messrs. E. Scott & Co. have just introduced the latter arrangement for fan and dynamo driving, and the experiment has been attended with much success. Manufacturers of steering gears, windlasses, steam winches, bilge and ballast pumps, ash hoists, &c., continue to have plenty of orders, and makers of engine room telegraphs and other specialities for steamships are very fully employed. Iron and brass foundries are doing a steady business, and both steel works and iron works show sustained activity, the orders which were booked last year not being yet worked out. Steamers' outfits of chains and anchors are still being ordered largely, and the factories where such specialities are produced are kept pretty busy. Messrs. Dixon & Corbitt, and R. S. Newall & Co., rope manufacturers, Gateshead, are doing a large business in steamers' rigging, and are plentifully supplied with work of other descrip-

tions. Messrs. Geo. Angus & Co. Limited, manufacturers of special packings for compound and triple-expansion engines, rubber valves for air and circulating pumps, leather and rubber hose, &c., have been considerably pressed with work in their various departments for some time past, but the greatly increased productive power lately acquired by the extension of the premises, and the putting down of new plant, is now enabling them to meet with promptitude even the most urgent requirements of customers. The whole of the company's premises are now lighted with the electric light, supplied by the recently formed Newcastle and District Electric Lighting Co., and a great improvement is thus effected, not only in enabling the workpeople to perform their tasks at night-time with a closer adherence to accuracy, but also in providing them with a purer breathing space.

#### THE WEAR.

**Shipbuilding.**—The shipwrights on the Wear have asked for an advance of wages as well as those on the Tyne, but in this case the question will be settled through the medium of the Conciliation Board, which was established some half-dozen years ago, and has already accomplished much good by the prevention of strikes. Very few, if any, new contracts have been booked by builders since the opening of the year; but the almost complete cessation of orders has not yet affected the state of work in the yards, as the berths were already well filled when the year began, and there was in the majority of cases a good store of orders in reserve. Messrs. J. L. Thompson & Sons are preparing to launch a large vessel which is said to be intended for the laying of submarine cables, and they have also in forward stages other vessels of a special class. In the frame-bending department considerable activity exists. A circumstance which affords to the hands engaged at outside work a prospect of full employment for some months to come. At the Strand Shipbuilding Co.'s yard a vessel, which was recently launched, is being fitted out for employment in the dead meat trade; second vessel of similar type and intended for the same purpose, is in an early stage of construction. At the Deptford yard (Mr. J. Laing's) some important repair contracts have been completed during the month, and satisfactory progress has been made with the new vessels on the stocks. The fact that the employment of iron for shipbuilding purposes is not yet quite done with, is shown by the circumstance that Messrs. R. Thompson & Sons have just commenced the construction of a vessel, which is to be built exclusively of that material. The vessel, which is of small size, is understood to be intended for the coal trade. Messrs. W. Doxford & Sons have their available building space fully occupied, and at Messrs. Short Brothers' yard there are four vessels of large tonnage on the stocks. Messrs. Osborne & Graham have also four vessels in course of construction, and Messrs. Pickersgill have three on the stocks, one of them being of exceptionally large dimensions. At all the other yards trade continues tolerably brisk, repair work in several cases constituting a substantial addition to the ordinary business of the establishment. It may be stated here that ships' boat builders have just had their wages raised from 34s. 6d. to 36s. per week.

**Engineering.**—Mr. John Dickinson, of the Palmer's Hill Works, has just now in hand a set of exceptionally large engines for which the bed-plate, weighing 17 tons, was recently delivered from a Newcastle foundry. It is understood that the engines are intended for a vessel now in course of construction at the North Sands yard. There continues to be a good demand for Dickinson's patent crank shaft, and some finely finished specimens of that well known speciality have been turned out within the last few weeks. The other marine engine works on the river are still very busy, and night work is being pretty generally resorted to. Messrs. John Lyne & Co. have a large amount of work in hand, consisting of steering gear, steam winches, bulkhead doors, and other specialities, ordered principally by shipbuilders in the district. Messrs. Welford Brothers are also very busy with the same classes of work, and other firms engaged in a similar line of business continue to be well employed. In the forges activity still very generally exists, although contracts are now more difficult to obtain than towards the close of last year. The Monkwearmouth Iron Works are kept busily going, the manufacture of Bell & Rockliffe's patent sections constituting a large portion of the work in hand. The strained relations just now existing between the miners in the Durham coalfield and the coal-owners, are the cause of considerable anxiety in commercial circles, as in the event of the agitation for a wages advan-

15 per cent culminating in a general strike, the consequences, to many interests would be disastrous. The coal-owners have declared their inability to give the advance asked for, but have signified their willingness to accept the alternative of arbitration as a means of settling the question. At the time of writing it is not known whether the miners will act upon the suggestion thrown out by the owners, but it is probable that after duly considering the matter, they will decide upon taking the sensible course indicated.

**The Hartlepoons.**—The shipbuilding yards of Messrs. W. Gray & Co., Limited, continue to show great briskness, and at the Central Marine Engineer Works belonging to the firm work is still very plentiful. In the new forge, which was opened a few months ago, and which has been fitted up with every modern requirement for rapidity and economy of production, a large quantity of work, consisting of stern frames, keels, rudders, and engine shafting is now in progress, and the output is steadily increasing each week. At both Messrs. Withey's and Messrs. Irvine's yards business is also quite active; and the marine engineering establishment of Messrs. T. Richardson & Sons keeps as busy as ever. In the forging department of the firm's works there is quite an abundance of orders. The steel works are very fully employed, most of the material produced being absorbed in local ship and boiler building. At the Hartlepool rope works considerable briskness is to be noted, and the local cement works are in full activity. At the docks business is satisfactory, the weekly shipments of coals being above the average of recent years. In the timber trade, however, there is little or nothing doing, the imports having almost entirely ceased some weeks ago. The sawmills are kept pretty busy, and other local industries are generally showing a satisfactory degree of prosperity.

**Stockton.**—The whole of the Stockton shipbuilding yards have their berths well filled, and when launches take place keels for other vessels are put down without delay. Messrs. Craig, Taylor & Co. launched on the 19th inst., a large and well finished steamer, ordered by a Belfast shipowner, and they have other vessels in advanced stages on the stocks. The oil-carrying steamer *Petrolea*, launched by this firm last year, and engined by Messrs. Black, Hawthorn & Co., of Gateshead, has turned out to be a remarkable specimen of her class, having made her first voyage from Batoum to Trieste, with 3,500 tons of oil, in less time than any other vessel has yet accomplished the journey in. This is a feat of which both the builders and the makers of the engines may well be proud, and if the sister vessel to the *Petrolea*, which Messrs. Craig, Taylor & Co. are now getting ready for launching, makes her first run with equal success, the circumstance cannot fail to greatly enhance that firm's reputation. Messrs. Blair & Co. have all their departments still very busy. Since January 21st the following vessels, engined by the firm, have had their trials:—The s.s. *Ormesby*, built by Messrs. Ropner & Son, of Stockton, for Messrs. Ropner & Co., of West Hartlepool, having engines of 210 H.P. nominal, with cylinders 28 in., 38 in., and 62½ in. by 43 in. stroke. The s.s. *Eugenie*, built by Messrs. Richardson, Duck & Co., Stockton, for Messrs. Burdick & Cook, London, having engines of 155 H.P. with cylinders 21½ in., 35 in., and 57 in. by 36 in. stroke. The s.s. *Oswin*, built by Messrs. Turnbull & Son, Whitby, for Messrs. Turnbull Bros., of Cardiff, having engines of 140 H.P. nominal, with cylinders 20 in., 33 in., and 54 in. by 36 in. stroke. The engines of all the foregoing are constructed to work at 160 lbs. pressure of steam, and on their trials gave complete satisfaction. The firm have also fitted several vessels with their machinery in the time indicated, and have supplied a complete electric light installation to the s.s. *Gulf of Akaba*, belonging to the Greenock Steamship Co., this being the tenth vessel fitted by Messrs. Blair & Co. with the electric light for the same firm.

**Middlesborough.**—In the Middlesborough shipyards activity is still the rule, and both engineers and iron foundries are fully employed. A new steel works has just been started under favourable conditions for the attainment of ultimate success. The principal products for some time to come will be nail and tube strips of Siemens-Martin steel, and for these classes of goods there are plenty of orders in hand. In course of time, it is intended to produce steel bolt and rivet bars as well as special steel required for engineering purposes. The Cleveland ironstone is in advance of wages, which the owners have refused to give.

**Blyth.**—The Blyth Shipbuilding Co. have at present on their stocks a steamer of 4,000 tons carrying capacity, which is in course of being plated, and one of 1,600 tons in an earlier stage of construction. They have besides, a vessel of 2,600 tons in the framing stage, and are laying the keel of another 1,000 tons. The completion of the new graving dock, like most other big undertakings, has been put back from the time anticipated, but it is expected that in five or six weeks from now all arrangements for opening the dock for the accommodation of vessels up to 350 ft. in length will be completed, and that the opening will then undoubtedly take place. The company, having the best modern machinery and appliances for shipbuilding purposes on the spot, will be in a position to undertake, on the most advantageous terms to shipowners, all kinds of repairs to the hulls and machinery of vessels, as well as to carry out the same with exceptional quickness. The opening of the dock will no doubt contribute to the prosperity of the port, which is already increasing steadily.

### NORTH-WEST OF ENGLAND.

**Barrow-in-Furness.**—The shipbuilding and engineering trades have been busily employed during the past month, and although no orders have been booked for new steamers or sailing ships there has been an increased and increasing activity day by day, because as orders in hand have progressed, more and more hands have been required in the several departments. Builders are in fact so well placed with orders that they have not been on the outlook for new ones. On the other hand shipowners have been fighting shy, and have suddenly suspended orders not as an indication that they have determined not to build at present, but in the hope and belief that by waiting a short time they will be able to secure deliveries of cheaper material. It is difficult to say whether this hope will be realised, because at the present moment makers of steel shipbuilding material are as fully employed in every department as they possibly can be, and they are in fact in many cases unable to give deliveries of steel they have already contracted for. This is a position which is likely to be maintained for the greater part of the present year, as makers are fully sold forward until the autumn. It is therefore difficult to see how prices can be materially reduced for some time to come. If only a few orders are placed for new ships it will be sufficient to assure a full maintenance of present prices for a long time to come. Ship-plates are quoted at £8 15s. per ton, and angles, channels, &c., at £7 15s. In the case of the Naval Construction and Armaments Co. at Barrow, considerable inconvenience is experienced at present by the non-delivery of steel on order. This company has placed large orders not only at Barrow, but at Glasgow and elsewhere, and the makers are so busy that they cannot complete the deliveries within the specified time. This is not only keeping work back in the building yards, but it is stopping men who are ready to work if they had the necessary material to go on with. There have been during the month several new enquiries for shipping, but nothing has been decided on in the way of orders, although several large contracts are pending, which sooner or later will, it is expected, be placed in this district. It is anticipated that a good programme of work in shipbuilding and engineering will fall to the lot of the Barrow company. The managing director of this company, on the occasion of the launch of the *Coomassie*, on Saturday, February 22nd, said his company had already in hand a good share of the Atlantic work, and more would follow in a short time if he could only secure deliveries of steel, and if the men in the employ would refrain from striking, a position which he sincerely hoped would be avoided in the interests alike of the men and the company. Mr. Bryce-Douglas further remarked that he could keep the Barrow yard in constant and regular work, if those engaged under him would pull together with him for their mutual interests; and all orders received by the Naval Construction and Armaments Co. would be found to confer a double advantage on Barrow, inasmuch as not only would the ships be built in the town, but the steel of which they were constructed would be made at the adjoining steel works. Some difficulty has been experienced during the month with the blacksmith strikers employed by the Barrow company, but they have returned to work on old terms. There is at present some agitation going on among the joiners, but it is hoped the difficulty with them will be settled without a strike. In the marine engineering trade there is great activity, and the works at

Barrow are now working night and day, and have plenty of work before them for months to come. The same remark applies to the boiler-making trade. The dearth of steel shipbuilding material has led to the placing of three large orders at Barrow for triple-expansion engines and new steel boilers for old steamers now employed in the Pacific trade, and others are expected to follow. It has been proved economical to supply engines of the old type in all old steamers, and many ship-owners are taking this course in preference to building new vessels, and that is especially the case now, when steel shipbuilding material is so dear. There is some talk of extending one of the large iron and steel works at Barrow, with a view to the production of steel plates, angles, and other shipbuilding material, and other developments are also contemplated, but the scheme is at present only in a preliminary stage. Messrs. Westray, Copeland & Co., Limited, engineers, has been floated. It is one of the largest engineering firms in Barrow, and has done a considerable and satisfactory trade in the past as a private concern in marine engineering, a department which in future, under the management of Mr. Copeland, will be especially well looked after, and there are already indications of good orders coming to hand. Mr. E. Fitzgerald, late of the Bessemer Department of the Barrow Steel Co., has been appointed works manager of a new steel-making company at Bilbao, Spain, which is putting down a Siemens-Martin's plant for the production of steel shipbuilding and other material required for the new shipbuilding firms which have lately commenced business at that place.

**Whitehaven.**—The shareholders of the Whitehaven Shipbuilding Co. have determined to wind up the concern and have accordingly put the company into liquidation. The effort to sell the yard to private owners was not successful.

**Maryport.**—A steady but not large business is being done by the shipbuilders at Maryport, but they do not report any new orders.

### THE MERSEY.

THE indications of some slackening off—if not in present activity—at any rate, in the weight of new work in prospect, to which we referred in our last report, are becoming more distinctly visible. The shipbuilding yards on the Mersey and the marine engineering works in Liverpool and district are, it is true, exceedingly busy, and likely to continue so in most cases for some time to come, but the reports are becoming more general that inquiries with regard to new work are decidedly falling off, and when the orders now in hand are run out, the prospects of replacing them are not encouraging, so far as maintaining the present activity is concerned. It would perhaps be taking far too pessimist a view as to the future to assume that the improvement in trade has already expended itself, and that a down-grade movement back to depression has commenced, but certainly the "booming" tendency has passed away. This, however, may not be at all a regrettable course of events, and although for the moment there is unquestionably a less buoyant tone, the check which has been given to what was really a too rapid development of industrial activity, with the consequent excessive inflation not only of the rate of wages demanded by the workmen, but in the price of all descriptions of material, may tend to place trade on a more healthy basis, and give greater permanence to the improved condition of industrial enterprise. So far as the shipbuilding industry is concerned, the enormously increased tonnage built during last year, and the immense tonnage at present in hand, are sufficient to account for some lull in the demand for new vessels without at all justifying the conclusion that there is any approaching collapse of activity in this branch of trade. Shipbuilders are mostly so heavily committed for some time to come that very few of them could undertake to lay down new vessels, which might now be ordered, until late on in the year, and except where there is any pressing necessity there is a disposition to wait until some of the present pressure is exhausted before giving out orders for new vessels, which cannot be commenced for some months to come. The recent collapse of the speculative boom in the iron market, which had been forcing up prices on a fictitious basis, that had nothing whatever to do with the legitimate requirements of trade, of course offers a still further strong inducement to a policy of waiting, and any lessening of new inquiries may not so much represent an actual falling off in trade as a

temporary withholding of orders which will be given out when shipbuilders are more in a position to undertake new work for earlier completion than they can now promise, and there is a confidence that prices have settled down to a legitimate basis, and are not being governed by speculative operations on the one hand, or on the other, by temporary excessive pressure to buy, induced by over anxiety as to possible further considerable upward movements. So far as the marine engineering firms are concerned, they are necessarily being kept fully employed in supplying the motive power, and the various fittings required for the equipment of the large number of vessels now being built, but some of the leading firms report a most decided falling off as regards new work to follow up the orders they have now in hand; and although there is no prospect of actual slackness for some considerable time, the outlook ahead is not at all promising. This shrinkage of new inquiry is tending to bring down the higher prices which have of late been ruling for some classes of material, both in shipbuilding and engineering work, which will place firms in a more favourable position in quoting for new work; but so far as the labour question is concerned, the difficulties seem rather to increase than to diminish. Amongst the workmen generally a restless feeling seems to prevail, and constant demands, in one form or another, are put forward, all tending to increase the cost of production. As we have previously reported there has already been an advance of fully 25 to 30 per cent. in the wages of the men engaged in the shipbuilding yards; and in addition to actually increased rates of pay, all sorts of extra allowances are demanded. Now there is more or less general movement in the engineering shops for a further advance in wages. The moulders are demanding a further advance of 10 per cent and this has already resulted in a stoppage of work at some of the shops, whilst other branches of the engineering trade are following in the same direction, and there is anything but a satisfactory outlook as regards the relations of capital and labour in the immediate future. Another movement has been inaugurated in the Lancashire district which, although the representatives of the workmen profess that it will result in tending to limit disputes and lead to a more clear understanding with the general body of employers in the various questions of vital interest to the workmen, is really a further step in securing a stronger combination of Trades Union organisations for purposes which can only be antagonistic to the interests of employers. Recently, as it is well-known, the employers in the shipbuilding and engineering trades have found it absolutely necessary to secure some more closer union amongst themselves in order to resist the constant demands which have of late been put forward by their workmen. This has resulted in what is termed a federation of employers in the above industries, and the Trades Union societies have very promptly followed in adopting similar action. During the past month a meeting of representatives of the Councils of the Amalgamated Society of Engineers, London; the Steam Engine Makers' Society, Manchester; the Iron Founders' Society, London; the Amalgamated Society of Joiners, Manchester; the Associated Shipwrights' Society, and the Co-operative Blacksmiths' Society of Newcastle; and the Associated Blacksmiths' Society of Glasgow, held a meeting in the offices of the Steam Engine Makers' Society, Manchester, for the purpose of discussing the recently formed employers' federation, with the result that it was decided to form a similar federation of Trades Union societies in connection with the shipbuilding industries. A code of rules was discussed, and a committee appointed to submit the proposed new rules, together with the objects of the federation, to the various societies affected. These various movements, both on the part of the employers and workmen, all point in the direction of a more united banding together of their respective forces, which would seem to indicate that on both sides a severe struggle between capital and labour is regarded as almost inevitable. A similar movement has been going on in the coal trade, the miners' associations throughout nearly all the principal mining districts having formed themselves into one federation, which has been followed by the formation of a federation of coal owners, several meetings in connection with which have been recently held in London at which the memorandum and articles of association in connection with the new organisation, which is to be called the Colliery Owners' Insurance Co., Limited, have been considered and unanimously agreed to. The last meeting held was largely representative of the various important districts, and the leading centres have given in their adhesion to the scheme. With regard to the coal trade the outlook is already of a some

In the steel plates and other material for shipbuilding purposes there has been a decided slackening off in the demand, and an absence of inquiries of any importance is now generally reported. Prices are easier, in some descriptions showing a substantial reduction upon the rates last quoted. Ordinary steel ship plates are quoted at about £10 5s. to £10 7s. 6d., and steel boiler plates at £11 5s. to £11 7s. 6d. per ton, less 2½, ex steamer Liverpool, but actual specifications would be accepted at under these figures. Other descriptions of manufactured steel have given way about 5s. per ton on last month's quotations, angles and plain bulbs being now quoted £8 17s. 6d., tee's at £9 17s. 6d., and round, square, and flat bars at £9 7s. 6d. per ton, less 2½, delivered ex steamer Liverpool.

For all descriptions of manufactured metal goods there has been a very decided quietening down in the demand, but quoted list rates remain unchanged from those given last month. Manufacturers in most cases are sufficiently well supplied with orders to render them quite independent of further business for the next two or three months, whilst the advance which has been conceded in wages, together with the shortening in the hours of labour, necessarily tends to prevent any retrograde movement in prices, which, but for a falling off in the demand, would no doubt have been still further advanced.

Notwithstanding the greatly extended scale of the timber trade during 1889, when the consumption showed an increase of something like 15 per cent., the imports have been so largely in excess of requirements, showing an aggregate increase of 37 per cent. on the previous year, that the stock of timber in hand is now more than double that held at this time last year. Although the trade has been fairly satisfactory generally, the excessive imports have latterly brought about a decline in the prices of some of the leading articles. The consumption, as already stated, though large, has not by any means equalled the heavy import, and the large stocks carried forward are inducing extreme caution on the part of producers and shippers, as the market, already so well supplied, will only require a very moderate import for the coming season. The large amount of steam tonnage now engaged in this trade, bringing cargoes forward so much more rapidly than formerly, also requires less stocks to be held in this country. This, with the weakness of freights, has caused buyers to be cautious in contracting for the coming season. The stocks held at the leading ports of the United Kingdom, it may be added, are generally large.

### WELSH NOTES.

AT the time of writing this, no notice has been issued calling the first meeting of the Barry Dock shareholders since the continued working of the company, but there are satisfactory rumours afloat as to the dividend to be declared. Some of those supposed to be the best able to judge have estimated that the dividend for the half year will amount to 3 or 4 per cent., which is at the rate of 12 per cent. per annum, for the company has only been in actual work for about four months of the six. But whatever the dividend may be, it is certain that during the past few weeks there has been a considerable rise in the value of the shares. They have jumped from 140 to 155. Whether these shares are really worth such a premium remains to be seen. But whatever the supposition may be as to the Barry profits for the period the dock and railway have been working, there is a solid certainty in the fact that the Taff Vale shareholders only received 10 per cent. at the recent distribution of profits. This is bad enough, but there are critics who say that when the Barry Dock has its full number of tips going, the Taff dividend will drop to 4 per cent. Four per cent. on some railways is thought much of, but to investors who have, like those in the Taff Company, been getting as much as 15 per cent., a paltry four is much akin to starvation. Possibly some working agreement may be come to amongst the Cardiff companies, and it cannot be denied that such an arrangement would be to the advantage of all concerned. Of course now that the Barry Dock is established, the Bute Docks are sure to experience a falling off in the shipping of coals, but after all this only leaves more accommodation for an import trade. But even in the coal trade, the Bute authorities seem determined to leave no stone unturned to secure new work. It has been announced during the past month that a Cardiff syndicate has been formed for the purchase of a group of collieries hitherto owned by Messrs. Watts, Ward & Co. Under the ownership of this firm, the output of the collieries was almost exclusively shipped at Newport, but under the new management the coal will be shipped at Cardiff. Should this be done, Newport's coal shipments will be decreased by about one-third.

The competition between the Taff Vale and Barry lines, as appears from the recently issued report of the Swansea Harbour, has affected that port to the extent of 131,327 tons. This would not have happened if the G.W.R. had reduced their rates on coal from certain districts as the Swansea people asked. The railway authorities should certainly know their own business best, and no doubt had a good reason for not doing as they were asked, but yet we think that had they been approached in a different manner the rates might have been reduced.

The Cardiff system of arranging the trimming of coal cargoes came in for a considerable amount of hostile criticism at the recently held annual conference of Chambers of Shipping, but we must confess we can scarcely see where Cardiff is any worse than any other coal ports. The shipowners complained that they had no voice in the trimming of their ships, and that the work very often was improperly done.

Satisfactory progress is apparently being made with the new Downais works at Cardiff, and it is expected that the blast furnaces will be ready for work in about four months' time. The steel furnaces are, however, not nearly so far advanced.

Much annoyance has been caused to the many hundreds of people doing business at Cardiff Docks for months past, by the constant striking of the tramcar men. Whilst the men had actual grievances popular sympathy was with them, but at the time of writing this the men are out simply because the company's manager has an old-fashioned notion that he should be the master and not the servant of the men. It is quite time that the Cardiff authorities took the matter up. It is perfectly disgraceful that business men should be harassed in this manner. If the present tramway company cannot serve the public properly the sooner their concession is cancelled the better for the people who rely upon the tramway to take them to the docks.

A London financial paper has been rather sharply criticising an attempt which is being made to secure a capital of £65,650 for the Cardiff Floating Docks and Ship Repairing Co., Limited. We think we recognise here an old friend with a new face, but we cannot understand the promoter of the new company advertising for capital in the manner he does. If the new scheme were really a good one there should be no difficulty in raising the necessary money in Cardiff.

It was stated at a recent meeting of the Newport Chamber of Commerce, as showing some people's idea of the position of Newport, that a letter had been received bearing the address: "To the Hon. the Mayor of Newport, Cardiff."

At the same meeting the old question of the night charges at the Alexandra Dock came up again, and it was contended that they were illegal. If this be really so, why do not the Newport merchants take steps to compel the Dock Company to cease levying a charge which does so much injury to the trade of the port?

The tin-plate trade is in a very unsatisfactory condition. Enquiries are few, prices are low, and the cost of raw materials high. It is reported that several works are about stopping on account of this, and unless a change comes soon there is no saying in what straits some of the weaker makers may not find themselves.

Financially the Cardiff Chamber of Commerce appears to be in a very sound condition. At the recently held annual meeting it was stated that the Chamber was the proud possessor of £400. This was the most satisfactory item in the report. The statement as to the proposed Harbour of Refuge at Lundy was by no means satisfactory. It was stated that the result of the deputations to the Board of Trade and the Admiralty showed that there was little chance of the Harbour ever being constructed unless the shipowners agreed to pay a tax for its construction.

A Bill has been deposited by the Bute Docks Company, one of the clauses of which cannot fail to cause much opposition. It is one providing for the transfer from the Rhymney Railway Co. to the Bute Co. of powers obtained by the former company in 1880, to construct new lines affording means of communication between Cardiff and the Monmouthshire coalfields. Evidently the Bute authorities are determined to leave no stone unturned in their attempt to make up the trade taken from them by Barry.

The usual half-yearly meeting of the Rhondda and Swansea Bay Railway Company was held at Swansea on the 15th ult. The shareholders were delighted to learn that the line would certainly be open for through traffic on the second Saturday in May. Very much unnecessary time has been spent in the construction of the new line, but with completion so near the shareholders appeared to be disposed to have no haggling. One proprietor certainly made a bit of a scene, but he is a sort of South Wales John Abbot, and his complaints are expected, although they are by no means so justifiable as were the late Mr. Abbot's in connection with the South Eastern.

Coal prices are well maintained and some owners have given notice that they will put up their prices by sixpence a ton on and from the first of March.

Since writing the first paragraph of this month's notes the

Barry dividend has been announced. So far from 12 per cent. per annum being declared, the shareholders are only to receive at the miserable rate of  $\frac{1}{2}$  per cent. per annum. Surely some explanation is very necessary.

### BELFAST TRADE NOTES.

THE strike among the dock labourers has been causing much inconvenience. Ships arriving in the early part of February to discharge had to be content with such small gangs of raw hands as they could pick up; now, however, the work of discharging vessels is done by means of non-Society men without any interference from the men on strike. Several of the latter have started work again, and it is thought that the strike cannot last much longer and that the power of the Union is almost completely broken.

All the shipbuilding yards continue very busy, but orders are not coming to hand as they were some time ago. Workmen are now becoming plentiful, and are working steadily. Ship carpenters have been granted an increase of 1s. per week. Several large vessels are ready to be put into the water, and others are in an advanced state of completion.

The stocks are all full, and several large vessels are lying in the finishing berths. Inquiries, however, for new vessels are rapidly falling off, and as wages still have an upward tendency, it is expected that they will become still fewer.

The boiler-making industry continues good. Several large orders are now in hand for land boilers. Two very large boilers have recently been completed by Messrs. Victor Coates & Co., for the Hilden Thread Factory, and much more work of this sort might be done in this district if makers were a little more enterprising.

### LEITH NOTES.

ALL the engineering shops and shipbuilding yards are full of work, but no new orders are on the books, and the end of the exceptional briskness of last fall is imminent in most cases.

There has been five launches in the Firth of Forth this month as follows:—The *Alderman Readhead*, a wooden steam line fishing-boat, 76 ft. long, 17 ft. broad, and 9 $\frac{1}{2}$  ft. deep, built by Messrs. Marr Bros., and engined by Messrs. Cran & Co., Albert Engine Works, Leith. The *Simon Dumois*, a steel crew steamer, 180 ft. long, 28 ft. beam, by 19 ft. 8 $\frac{1}{2}$  in. to awning deck, built by the Grangemouth Dockyard Company, and to be engined by Messrs. Hutson & Corbett, Kelvinhaugh Engine Works, Glasgow. This is the first of six steamers at present building by the same company for the fruit trade between the West Indies and America. The *Otra*, a steel screw steamer, 190 ft. long, 30 ft. broad, 15 ft. 9 in. deep, built and engined by Messrs. S. & H. Morton & Co., Leith, to the order of Messrs. Charles Salvesen & Co., Leith, for Norwegian owners. In addition to these three, Messrs. Hawthorns & Co. launched a steel screw barge for the Admiralty, and Messrs. Ramage & Ferguson launched a twin-screw steamer, named the *Heung-Shan*, built for Chinese river service, to attain a speed of 15 knots on a light draft. There has been two trial trips in the Firth of Forth this month, one on the 14th inst., of the s.s. *Jarnac*, built and engined by Messrs. S. & H. Morton & Co., Leith, for Messrs. T. & J. Harrison, Liverpool; the other of the s.s. *Weimar*, built and engined by Messrs. Ramage & Ferguson, Leith, for Messrs. James Currie & Co.'s Leith and Hamburg trade.

Mr. R. Mullineux Walmsley, D.Sc. (Lond.), has been appointed to the chair of Physics and Electrical Engineering in the Heriot-Watt College, Edinburgh. He is an associate member of the Institute of Electrical Engineers, a member of the Physical Society of London, as well as a Fellow of the Chemical Society of that city, and will be a valuable addition to the staff of professors in this excellent technical institute.

Owing to the want of dry dock accommodation on the east coast of Scotland, a number of influential gentlemen have at present under consideration a proposal to erect a patent slipway at Burntisland. The proposal has received the support of a large number of shipowners at Leith, Grangemouth, and although nothing definite has yet been ascertained that the project will be carried

out. Notwithstanding the adequate dry dock accommodation at Leith, it too often happens that steamers have to wait for days until they can be admitted into dry dock, causing considerable inconvenience to shipowners. The slip will probably cost something like £30,000, and will either be erected at the old steamboat goods pier or at the West Harbour.

The secretary of the Edinburgh Chamber of Commerce has received a letter from the Secretary of State for Scotland, to the effect that in the opinion of the naval and military authorities, Her Majesty's Government would not be justified in incurring financial responsibility in regard to the proposed Forth and Clyde ship canal. At a meeting of the promoters, held in Glasgow on February 8th, Messrs. Crouch and Hogg, civil engineers, Glasgow, were instructed to make a survey of the route, and report to the committee.

At a meeting of the Forth Bridge Railway Company, held in Edinburgh on February 7th, a new Bill bringing up the cost of the bridge and connecting railways to £3,250,000 was approved of by the shareholders present. The tickets to the opening ceremony of the bridge on March 4th are being sent out, and some ill-feeling is existing, owing to the omission of several influential citizens.

The engineers employed in the various engineering establishments at Dundee have agreed to accept the employers' offer of one shilling per week to settle the dispute. The original demand of the men was two shillings.

The Electrical Exhibition of Edinburgh, 1890, is now rapidly approaching completion, and the executive look forward to a complete success. At a meeting held on February 14th, on the recommendation of the electrical committee, instructions were given for proceeding with the track of the electric railway to run from the Caledonian Station to the bridge over the canal, adjoining the main entrance. It was also agreed to accept the offer of the Telfer Railway Company for the erection of one of their lines on the north-east ground of the Exhibition.

THE Union Steamship Company's Royal Mail steamer *Athenian*, which left Cape Town at 5.35 p.m. on January 22nd, arrived at Southampton at 4.15 p.m. on Sunday, February 9th, her gross time of passage being 17 days 22 hours 40 minutes, and her net steaming time 17 days 18 hours 42 minutes, the distance run being 5,987 miles, giving an average speed of 1,404 knots per hour over the whole course.

NEW NILE STEAMER.—CAIRO, Jan. 29.—An interesting event took place on the river here to-day, being the trial trip of *Rameses the Great*, the largest tourist steamer yet seen on the Nile. A distinguished company, comprising several Ministers and Sir F. Grenfell, were on board. It is exactly 20 years since the first party of tourists started for the First Cataract by steamer, and in that space of time it is estimated that between three and four millions sterling have been circulated by travellers in Egypt. To-day there are 17 steamers working on this service.

INSTITUTE OF MARINE ENGINEERS.—The next meeting will take place at the Langthorne Rooms, Stratford, on Tuesday, 4th March, when the paper to be read is on "Friction of Screw Propelling Engines," by Mr. W. J. N. Brett (Associate).

THE fortunes of commerce have lately sided well with the interests of purchasers of relinquished ship hulks. The profits realised in the case of the renowned but now degraded leviathan *Great Eastern*, owing to the enhanced prices reigning in the metal market, have been handsome. Although the price—£1,770—paid for the hulk of the training ship *Cumberland*, burnt off Row on the Gareloch, just one year ago, seemed large at the time, the purchaser, Mr. J. J. King, of Manchester, is understood to have found the speculation not an unprofitable one. The work of demolition of the remains has been carried on during the greater part of the past year, and in addition to some 200 tons of iron ballast a goodly amount of copper, in the shape of bolts, nails, and sheathing, has formed a valuable part of the salvage. Some of the bolts were of massive dimensions, as much as 2in. by 2in. square, and bolts and nails alike bore the Government broad-arrow. Demolition has not been the easy matter which the great age and latter misfortunes of the *Cumberland* might have suggested. She has been found a magnificent specimen of old-time shipwright work, and her keel and a goodly number of her staunch ribs still occupy the shores of How Bay.

## THE NORTHWICH BOILER EXPLOSION.

## OFFICIAL REPORT.

THE report of the Commissioners (Mr. Howard Smith, barrister-at-law, and Mr. W. C. Lang, consulting engineer), who held, on December 16th last, a formal investigation into the circumstances attending the explosion of a boiler on board the s.s. *Development*, belonging to the Salt Union, Limited, which occurred on October 19th in the River Weaver, near Northwich, has been issued by the Board of Trade. After describing the construction of the boiler, and giving particulars as to its repairs, and the results of the explosion, the Commissioners state: "The explosion was caused by an undue pressure of steam in the boiler. The safety-valve was found, on examination, to have been rendered entirely inoperative by a wooden wedge which had been inserted between the top edge of the lever and the top of the guide bracket."

On the question of responsibility the Commissioners remark: "The boiler came into the possession of the Salt Union Company in December, 1888, and so far as we have been able to ascertain, they did not know, and in fact they could not have known, the proper working pressure of it. . . . There was no stamp on the valve, for it was not one of that sort of valve on which a stamp is generally found. There was no mark on the steam gauge indicating the pressure which the responsible person who had made or repaired the boiler had ascertained to be a safe working one. Therefore, in our opinion, it was the duty of the company to have found out by examination what was the safe working pressure of the boiler. In our opinion the company have failed in their duty, and are to blame. But the matter does not rest there. Mr. Stubbs, the superintendent engineer, goes on board the vessel and sees the steam blowing off at a pressure of 65 lbs. or 70 lbs. He also finds that the weight is at the end of the lever. . . . Mr. Stubbs, seeing what a high pressure 65 lbs. was for a small boiler of this kind, ought to have been on his guard, and to have calculated the proper working pressure for it. Further, he has told us that he knew one of the engine drivers had been tampering with one of the safety-valves of the boiler in his charge, for he saw by marks which he found on the lever that the safety-valve had been gagged down. Surely it was the duty of Mr. Stubbs to have reported that man to the directors, and if he had done so the directors would have been put on their guard and would have instituted inquiries as to this pernicious practice. Edward Dean, the boiler cleaner, has told us that about six months before the explosion he saw the safety valve of the *Development* plugged, and accused Penny, the engineer, of having tampered with it. If, therefore, Stubbs had made the report he ought to have made, the directors, on inquiry, in all probability would have discovered the dangerous practice that this unfortunate man Penny was resorting to." Then follows a reference to the direct personal responsibility of the managing director and general manager, on which the Commissioners do not express any opinion, but they go on to say that "the company is to blame for not having had the boiler thoroughly examined to ascertain its safe working pressure, and also because we think that there has been a want of general supervision over it." With regard to Mr. Stubbs, the Commissioners state, "We think he is very much to blame for disregarding the very high pressure at which he saw the boiler working, and for not reporting to the company the fact that one of their safety-valves had been gagged down." The report adds: "We directed that the Salt Union should pay to the solicitor of the Board of Trade the sum of £40 towards the costs and expenses of the investigation."

The point perhaps most deserving of attention is the following statement of the Commissioners: "We ascertained that it was a common practice for engineers employed on vessels plying on the River Weaver to tamper with the safety-valves under their control. . . . Mr. Falk, who was the originator of, and has been in the salt-carrying trade on the Weaver for fifty years, told us that this practice was a common one, and that he had ascertained that even engineers who were in receipt of so high a wages as £3 per week had had recourse to it. The above facts, following on the knowledge which we gained during the official investigation into the circumstances attending an explosion of a boiler on board the smack *Snaefell*, of Yarmouth, on which we had the honour to report to the Board of Trade, convince us that boilers on small steam craft of this description should be fitted with safety-valves that cannot be tampered with, or at all events cannot easily be tampered with.

We understand that the Salt Union intend to fit the boilers used on their vessels with lock-up safety-valves. It is to be hoped that other owners will do the same. Should they, however, not do so, we venture respectfully to suggest that the Legislature might interfere to compel them."

**CORROSION OF PROPELLER SHAFTS.**—An interesting example of the havoc which sometimes results from the commonly employed system of lubricating propeller shaft bearings by admitting sea water to the stern tube has recently come under notice. Messrs. S. & H. Morton, of Leith, on removing the brass liner from the propeller shaft of the screw steamer *Lofna* were surprised to find the shaft underneath the liner corroded and cut in to the depth of  $\frac{1}{2}$  in. On breaking the shaft at this corroded part it was found that the sectional area remaining intact was only 43.57 per cent. of the original area, or very considerably less than one-half. How the shaft should have continued running in this highly precarious state is truly astonishing, but the cause of its having got into such a state at all is no less curious and significant. This was due to the liner having been shrunk on in two pieces, the joint of which, although so closely fitted as to render it barely perceptible, yet permitted the admission of sea water to the bare shaft, with the result noted. This case doubtless illustrates the danger of fitting brass liners in two lengths, but it may also be considered as raising the point whether the frequency of breakdowns of shafting at sea may not often be due to the presence of brass liners—whether in one or more pieces—in conjunction with the admission of sea water to the stern tube. Brass liners are fitted less for the purpose of protecting the shaft from corrosion than on account of their wearing better when running on lignum vitae and admitting of wear without weakening the shaft thereby, but there seems little room for doubt that the bare shaft at the point, say, where the brass liner begins and ends, is particularly liable to corrosive influence. It remains, therefore, a point for serious consideration whether some system of lubrication should not be employed which would obviate the use of expensive brass liners altogether, and exclude from the bearing such a dangerously corrosive element as sea water.

ONE of the most remarkable instances of electrical transmission of power has only recently been accomplished in the State of Nevada, on the world-famous Comstock Lode and the almost equally famous Sutro Tunnel. At the Nevada mill there is a 10 ft. Pelton water-wheel, which receives water through a pipeline delivering water from the side of Mount Davidson under a head of 460 ft, giving 200 H.P. Here the water is again caught up, delivered into two heavy iron pipes, and conducted down the vertical shaft and incline of the Chollar Mine to the Sutro Tunnel level, where it is again delivered to six Pelton water-wheels, this time running under a head of 1,680 ft. Each of the six wheels is but 40 in. in diam., weighing 225 lb.; but with a jet of water less than  $\frac{1}{2}$  in. in diam. they develop 125 H.P. each. On the same shafts, which revolve 900 times a minute, are coupled six brush dynamos, which generate the current for the electric motors that drive the stamps in the mill above ground. The result is that, where it formerly took 312 miners' inches of water to operate thirty-five stamps, but 72 in. are now required to run sixty stamps. This is the most enormous head of water ever used by any wheel, and by itself constitutes an era in hydraulic engineering. A solid bar of iron thrown forcibly against this tremendous jet rebounds as though it had struck against a solid body instead of a mobile fluid. The speed of this jet, where it impinges against the buckets of the wheel, is two miles a minute—176 ft. a second. Alvan D. Brook, in the *Overland Monthly*, says:—"There is another quality of these extraordinary wheels which renders them absolutely without a peer in the large family of prime movers. This is the immense power exerted per pound of weight. Those in the Chollar Mine, for instance, give out 1 H.P. for every 1.8 lb. of weight."

**THE INVENTION DEVELOPMENT SOCIETY OF LONDON.**—This Society has been formed for the purpose which its title indicates, and is composed of Mechanical Engineers, Electricians, Chemists and Business Men. They have workshops and laboratories fitted with the latest improvements, and offices at 140 & 141, Temple Chambers, Victoria Embankment, London, E.C., the engineer of the Company being Mr. D. D. Esson (Gold Medallist) and Inventor of the "Esson Search Light."

## LAUNCHES AND TRIAL TRIPS.

## LAUNCHES—ENGLISH.

**Caxo.**—On January 22nd Messrs. Joseph L. Thompson & Sons launched from their shipbuilding yard at North Sands, Sunderland, a large steel screw steamer, built to the order of Messrs. R. Nicholson & Son, of Castle Street, Liverpool. The vessel has been built of Siemens-Martin steel, and under the special survey of Lloyd's for the 100 A classification. The engines are of the triple-expansion type, and are being fitted by Mr. John Dickinson, of Palmer's Hill Engine Works. The naming of the vessel *Caxo* was performed by Miss Ward, of Newcastle.

**Eagle.**—On January 22nd there was launched from the building-yard of Messrs. J. T. Eltringham & Co., South Shields, a steel screw steam tug named the *Eagle*. The vessel possesses exceptionally fine lines, and is expected to attain a very high rate of speed. The dimensions are 125 ft. long, 22½ ft. broad, and 13½ ft. deep. She has been built under special survey, and classed 100 A 1 at Lloyd's, the decks and deck fittings being of teak. All the most approved and recent appliances are fitted, including steam windlass; steam steering gear by Messrs. Alley, McLellan & Co., of Glasgow, and very powerful centrifugal salvage pumping machinery by Messrs. Drysdale & Co., of Glasgow. The propelling machinery consists of a single set of triple-compound engines, of 650 I.H.P., with cylinders of 16 in., 26 in., and 43 in. diameter, by 30 in. stroke, with steel boiler, working at 160 lbs. pressure. In addition to having every requirement for a first-class tug, the vessel is completely fitted for the passenger service, saloon and ladies' cabin being fitted in polished wood. The *Eagle* has been built to the order of Messrs. J. P. Rennoldson & Sons, of South Shields, who supply the machinery, and is owned by Messrs. Huddart, Parker, & Co. Limited, of Melbourne. After completion she will be sent out to the colony.

**Jane Radcliffe.**—On January 23rd there was launched from the Howdon Yard of Messrs. Palmer's Shipbuilding and Iron Co. a large steel screw steamer of the following dimensions: Length, between perpendiculars, 260 ft.; breadth, moulded, 37 ft.; depth, moulded, 19 ft. 5 in. The vessel will be rigged as a two-masted schooner, and is built under special survey to class 100 A 1 at Lloyd's. She is of the ordinary well-deck type, with the bridge extended to the foremast. All the decks are of iron, and a double bottom is fitted for water ballast throughout the cargo hold, and in the fore and after peaks. The vessel will be fitted with grain boards and other special fittings for the carriage of grain in bulk. The vessel has been built to the order of Messrs. Evan Thomas Radcliffe & Co., of Cardiff, under the personal superintendence of Captain Venables. She was named the *Jane Radcliffe* by Miss Radcliffe, of Cardiff.

**Chantrey.**—On January 24th Messrs. R. and W. Hawthorn Leslie, and Co. launched from their shipyard, at Hebburn a steel screw steamer 324 ft. by 42 ft. by 26 ft., built to the order of Messrs. Lamport & Holt, of Liverpool. She will be fitted with triple-expansion engines, having cylinders 24 in., 34 in., and 62 in., by 45 in. stroke, from the company's engine works at St. Peter's. The vessel was named *Chantrey* by Miss M. Gowans, of Hebburn.

**Screw Steamer.**—On February 4th there was launched from the yard of Messrs. C. S. Swan & Hunter, Wallsend, a steel screw steamer of the following dimensions:—Length over all, 240 ft.; breadth, 31 ft. 6 in.; depth, 21 ft. 10 in. The vessel will be classed 100 A 1 at Lloyd's, under special survey. Spar deck type, with cellular double bottom all fore and aft for water ballast, and will have accommodation for about 20 first-class passengers. Engines will be fitted by the Wallsend Slipway & Engineering Co., Limited, capable of driving the vessel a speed of 14 knots.

**Castlefield.**—On 5th February Messrs. Richardson, Duck & Co. launched from their building yard at South Stockton an iron screw steamer of the following dimensions:—Length over all, 287 ft.; breadth extreme, 37 ft. 5 in.; depth moulded, 21 ft. 9 in.; gross tonnage, about 2,180 tons. The vessel, which was built to the order of Messrs. F. Binnington & Co., is classed 100 A 1 at Lloyd's. She is of the raised quarter-

deck type with a short poop, and a long bridge extending to the stem, has a double bottom on the cellular principle for water ballast in the after and main holds, and under the engines and boilers she will be fitted with four steam winches; steam steering gear, stockless anchors, and all the latest improvements for facilitating the loading, discharging and manœuvring of the vessel, with Emerson, Walker & Co.'s patent steam windlass. Her engines, by Messrs. Blair & Co., Limited, are direct-acting triple-expansion, with cylinders 21 in., 35 in., and 57 in. by 39 in. stroke. As the vessel was leaving the ways she was gracefully christened the *Castlefield* by Mrs. Armour, of Newbegin House, South Stockton.

**Elisa Cerana.**—On February 5th there was successfully launched from the shipbuilding establishment of Messrs. W. Harkess & Son, Middlesbrough, a splendidly-modelled twin screw steamer, built to class 100 A 1 at Lloyd's (steel) and specially designed for the River Plate passenger trade. The vessel will attain a speed of 15 miles per hour, and, in addition to her large passenger accommodation, has a cargo capacity of 290 tons; when fully laden her extreme draft will be only 7 ft. 6 in. Her principal dimensions are 200 ft. by 28½ ft. by 8½ ft. moulded; she has a flush deck fore and aft of steel, with pine on top and large houses aft and amidships, which are to be fitted up in a luxurious style. The engines, which are a twin pair of triple-expansion of 900 I.H.P. will be fitted on board, at Arbroath, by Messrs. Alexander, Shanks & Sons, who also are the owners of the vessel; the boilers will be fitted on board on the Tyne by the Tyne Boiler Works Co. On leaving the ways the vessel was named *Elisa Cerana* by Miss Stephenson, of Middlesbrough.

**Armenia.**—On February 5th Messrs. W. Gray & Co., Limited, West Hartlepool, launched a fine steel screw steamer of the following dimensions, viz.:—Length over all, 300 ft.; breadth, 38 ft.; depth, 22 ft. 2 in.; built to class 100 A 1 at Lloyd's, and having large internal and deadweight capacities. She is of the favourite well-decked type, with poopaft, containing saloon and cabins for officers and a few passengers; long raised quarter-deck; long bridge, of extra strength, right up to fore-hatch, and containing comfortable quarters for the crew. A large deck-house is built on the quarter-deck to give good accommodation for the engineers. The topgallant fore-castle is fitted with Emerson, Walker & Co.'s patent windlass. The hull is built on the web-frame principle, dispensing with hold beams and giving a clear hold for stowing cargo of the bulkiest description. Large hatchways are fitted, four steam winches, steam steering gear amidships, and screw gear aft; two donkey boilers, and double bottom under each hold for water ballast. The boats will be carried on beams overhead, and the vessel schooner-rigged, with topsail, and she will in every respect be thoroughly equipped for general trading. First-class engines, on the three cylinder triple-expansion principle, are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. Working in three cranks, they will develop over 1,000 H.P. The cylinders are 22 in., 35 in., and 59 in. diameter, with a piston stroke of 39 in., and a constant supply of steam, at a working pressure of 160 lbs. per square inch, will be maintained by fine large steel boilers. The vessel was gracefully christened *Armenia* by Mrs. McModdie, of Greatham. The *Armenia* has been built for the fleet of Messrs. W. Gray & Co., of West Hartlepool, and during construction has been superintended by Captain J. E. Murrell. She will be commanded by Captain Atkinson, late of the s.s. *Deerhound*.

**Walker.**—On February 5th there was launched from the yard of Messrs. Wood, Skinner & Co., Bill Quay on Tyne, a steel screw steamer, built to the order of Messrs. Lambert Brothers, of London, and fitted out exclusively for the coal trade. Her principal dimensions are:—Length over all, 195 ft.; beam, 30 ft.; depth moulded, 14 ft. 3 in.; with a deadweight carrying capacity of 900 tons. The vessel is constructed on the cellular bottom principle, and has been built under Lloyd's survey. She is of the well-deck type, with poop, long raised quarter-deck, and bridge-house amidships for the accommodation of the officers. Emerson & Walker's patent windlass is fitted forward, Donkin & Nichol's steam steering gear amidships, and Hastie's screw gear aft. A special feature is the fact that the masts and funnel are so constructed as to be easily lowered whilst passing under the bridges across the Thames. The engines have been built, to Lloyd's requirements, by the North

**Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne.** They are on the triple-expansion system, having cylinders 18 in., 26 in., and 43 in., and a stroke of 30 in., capable of indicating 550 H.P., and driving the vessel at a speed of 10 knots loaded. As the vessel left the ways she was named the *Walker*, the christening ceremony being performed by Miss Minnie Taylor. Captain Udall, who has been long in the same service, is to take command of the ship.

**Gladestry.**—On February 6th Messrs. Irvine & Co., West Hartlepool, launched a steel screw steamer of the following dimensions, viz.:—Length over all, 300 ft.; breadth, 38 ft.; depth 22 ft. 2 in.; built to class 100 A1 at Lloyd's. She is of the wall-deck type, with poop aft, containing saloon and cabin for officers and a few passengers. Engines, on the three-cylinder triple-expansion principle, are being supplied by Messrs. Blair & Co., Limited, Stockton-on-tees, the cylinders being 21½ in., 35½ in., 58½ in., stroke 39 in. Boiler pressure 160 lbs. per square inch, and she is fitted with patent steam windlass by Emerson, Walker & Co. The vessel was named *Gladestry* by Miss Marion Speak, Oxenhope, Keighley. The *Gladestry* has been built for the fleet of Messrs. Sievwright, Bacon & Co., of West Hartlepool.

**Nithsdale.**—On February 6th there was launched from the shipbuilding yard of Messrs. William Pickersgill & Sons, Southwick, Sunderland, a steel steamer of the following dimensions: Length, 270 ft.; breadth, 37 ft.; depth, 19 ft. 8 in. She is built to the order of Messrs. Robert Mackill & Co., of Glasgow, to the highest classification of Lloyd's. The engines will be supplied by Messrs. Geo. Clark, Limited, of Southwick, with cylinders 20½ in. by 33 in. by 54 in., and 39 in. stroke, and two large size boilers of 106 lbs. pressure. The vessel was named *Nithsdale* by Miss M. Pickersgill.

**Una.**—On February 8th an iron ketch-rigged steamer of about 130 tons was launched at Beverley; owned by the Union Steam Fishing Company, Grimsby.

**Bloodhound.**—On February 8th an iron yawl-rigged steamer of about 130 tons was launched at Hull; owned by the Humber Steam Trawling Company, Limited, Hull.

**Centurion.**—On February 8th Messrs. John Blumer & Co. launched from their yard at North Dock, Sunderland, the steel screw steamer *Centurion*. Length between perpendiculars, 270 ft. by 88 ft., 26 ft. moulded. Built to the spar-deck rule, with web frames and cellular bottom for water ballast. Her engines are of the triple-expansion type, by Messrs. Alley & MacLellan & Co., Glasgow, with cylinders 21 in., 33 in., and 54 in., with 42 in. stroke. Two steel boilers, with a pressure of 160 lb. per square in.

**Windsor.**—On February 13th Messrs. W. Gray & Co. Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length over all, 324 ft.; breadth, 40 ft. 6 in.; depth, 23 ft. 9½ in.; built to the order of Messrs. Watts, Ward & Co., London, and classed 100 A1 at Lloyd's. The vessel is of the well-decked type, with poop containing saloon and cabins for officers and a few passengers; long raised quarter-deck; long bridge of extra strength right up to fore hatch, and containing crew's quarters at fore end, and engineers' berths aft; open topgallant forecastle with Emerson, Walker & Co's direct steam capstan windlass. The hull is built on the web-frame principle, dispensing with hold beams and giving a clear hold for stowing bulky cargo. Large hatchways are fitted, four steam winches, steam steering gear amidships, screw gear aft, two donkey boilers, and cellular double bottom throughout for water ballast. The rig will be schooner with double fore topsails and topgallant sail. The boats will be carried overhead on beams, and a full equipment of modern appliances provided for general trading. The engines are on the three cylinder triple-expansion principle. The hull and machinery are being superintended by Captain J. A. Hodgson and Mr. A. H. Alchin, respectively, on behalf of the owners. The christening ceremony was gracefully performed by Miss Maude Appleby, of Greatham, the vessel being named *Windsor*.

**Hilda.**—On February 15th there was launched from the yard of Messrs. C. S. Swan & Hunter, Wallsend-on-Tyne, a steel screw steamer to carry 3,750 tons deadweight. The vessel will be classed 100 A1 at Lloyd's, and built under special survey, is of the builders' improved well-deck type, viz., with poop, long raised quarter-deck, long bridge-house, extending forward

of the fore mast, break forward of the fore mast, break forward of this and topgallant forecastle. Water ballast in a cellular double bottom, all fore and aft; four steam winches, steam steering gear, direct steam windlass, and all improvements of the most modern description. The engines are by the Wallsend Slipway & Engineering Co., Limited, and are of the triple-expansion type, capable of indicating about 1,200 H.P. On leaving the ways she was named *Hilda* by Miss Hilda Hunter.

**Storm King.**—On February 18th Messrs. Raylton, Dixon & Co. launched from their Cleveland Dockyard a large steel screw steamer, which has been built to the order of Messrs. W. Ross & Co., London. The particulars of the vessel are:—Length, 351 ft.; breadth, 42 ft. 6 in.; depth, moulded, 29 ft. 6 in., with a deadweight capacity of about 4,550 tons. She is built on the three-decked rule, having full poop aft, bridge amidships, and topgallant forecastle. Her engines will be fitted by Messrs. T. Richardson & Sons, Hartlepool, on their triple-expansion principle, with cylinders 28 in., 44 in., and 72 in. by 48 in. stroke. On leaving the ways the vessel was christened *Storm King*.

**Shaftesbury.**—On February 19th there was launched from Messrs. Craig, Taylor & Co., Thornaby Shipbuilding yard, Stockton-on-Tees, a handsomely modelled iron screw steamer, of the following dimensions:—Length, 278 ft.; breadth, 37 ft.; depth, 19 ft. 8 in. The vessel has been built with a long raised quarter-deck, bridge extending to and including foremast and forewinch, short well, and topgallant forecastle. She is fitted with web frames in after hold, and has double bottom for water ballast in holds and in peaks for about 500 tons. She will be fitted with four steam winches by Robert Roger & Co., of Stockton, and steam steering gear by Alley and MacLellan, Glasgow; patent windlass by Emerson, Walker, and Thompson Bros., Gateshead; lighthouses; Messrs. Hastie's screw gear aft, and all modern improvements, so as to admit of rapid loading and discharging. The engines, of the triple-expansion three crank system, are being constructed by Messrs. Westgarth, English & Co., Middlesbro'-on-Tees, and are of the following sizes:—20 in., 33 in., and 54 in. by 36 in. stroke, two large steel boilers, 160 lbs. pressure. The vessel has been built to the order of Wm. R. Rea, Esq., of Belfast, and has been superintended by Joseph Lewis, Esq., consulting engineer, of Belfast. As she left the ways she was gracefully christened *Shaftesbury* by Mrs. Doctor Blandford, of Norton (near Stockton).

**Amie.**—On February 20th Messrs. Edward Witley & Co. launched from their yard, at Hartlepool, a large iron screw steamer, built to the order of Messrs. Burdick & Cook, of London. She is a fine type of a modern cargo boat, with a large measurement and deadweight capacity, and built to the highest class at Lloyd's. The vessel has a long raised quarter-deck, short poop, long bridge-house, and a topgallant forecastle. The holds are fitted with iron-grain divisions, and all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of iron. In the main and after holds the vessel is built on the web-frame system, which gives great strength, and dispenses with all hold beams, thereby enabling the ship to carry cargoes of the bulkiest description. The cellular bottom is fitted all fore and aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Four steam winches, large donkey boiler, patent steam steering gear amidships, screw gear aft, patent steam windlass, stockless anchors hauling into hawse pipes, and other modern appliances are fitted for the handy working of the vessel. The saloon and cabin, providing accommodation for the captain, &c., is handsomely finished in polished hardwood, with painted panels, executed in a very elegant and effective style by the decorative staff of ladies employed by the firm. The steamer will be rigged as a two-masted fore-and-aft schooner, and has been constructed under the personal supervision of Mr. Cook. She will be fitted with triple-expansion engines by Messrs. Blair & Co., Stockton-on-Tees. On leaving the ways the vessel was gracefully christened *Amie* by Miss Lydia Burdick.

**Pecklington.**—On February 20th Messrs. W. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length, over all, 248 ft.; breadth, 34 ft.; depth, 16 ft. 7 in.; built to class 100 A1 at Lloyd's, and having about 1,900 tons deadweight capacity. She is of the favourite well-decked type, having saloon and cabin for officers aft, long raised quarter-deck, long bridge of extra strength up to fore

**hatch.** The topgallant forecastle for crew is fitted with Emerson, Walker & Co.'s patent windlass. The hull is built on the web-frame principle, dispensing with hold beams, and giving a clear hold for stowing cargo of the bulkiest description; four large hatchways, four steam winches, steam steering gear amidships, and screw gear aft, large donkey boiler, and double bottom under each hold for water ballast. The boats will be carried on beams overhead. The vessel will be schooner-rigged, and will in every respect be thoroughly equipped for general trading. First-class engines on the three-cylinder triple-expansion principle are being supplied by the Central Marine Engine Works of Messrs. W. Gray & Co., Limited. The cylinders are 18 in., 28½ in., and 42½ in. diameter, with a piston stroke of 33 in., and a constant supply of steam at a working pressure of 160 lbs. per square in. will be maintained by two large steam boilers. The vessel has been building under the superintendence of Captain Lilly, and is to the order of Messrs. Lilly, Wilson & Co., of West Hartlepool. On leaving the ways she was named the *Pocklington* by Miss Lily Wilson, daughter of one of the managing owners. The vessel will be commanded by Captain Coulson, late of the *U.S. Bedlington*.

**Avala.**—On February 20th Messrs. Ropner & Son launched from their North Shore Shipyard one of the largest vessels that has yet been built on the Tees. The dimensions are as follows:—Length over all, 384 ft. 3 in.; breadth, extreme, 42 ft. 3 in.; depth, moulded, 30 ft. 3 in. The ship will carry 6,500 tons deadweight, all told. She is built of Siemens-Martin steel on the three-decked rule, and will class 100 A 1 at Lloyd's. Her engines, by Messrs. Blair & Co., Limited, are of 2,340 I.H.P., which will give a speed of over 10½ knots, laden. The vessel was christened *Avala* by Mrs. Newell, wife of the senior captain of the fleet.

**Chios.**—On February 20th Messrs. Wigham, Richardson & Co. launched from their Neptune Works a steel screw-steamer, built for Messrs. the Deutsche Levante Line, of Hamburg, and intended for the Black Sea service. She is 271 ft. in length, 36 ft. in breadth, and 19 ft. deep. She will carry about 2,500 tons of cargo, and is rigged as a schooner. She has been built to the highest class of the Bureau Veritas. Her engines are also supplied by Messrs. Wigham, Richardson & Co. They are of the triple-expansion type, and have been built under the superintendence of Mr. Lass, of Hamburg. As she left the ways the vessel was named the *Chios* by Miss Wood.

**Denia.**—On February 21st there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a steel screw steamer built to the order of the Compania Valenciana di Navigacion de Valencia, of the following dimensions and particulars:—Length, 249 ft.; breadth, 35 ft.; depth of hold, 24 ft.; classed 100 A 1 at Lloyd's as a spar-decked steamer. The vessel is built with a short full poop, in which accommodation for captain and a few spare berths are fitted. The engineer's and officers are berthed amidships and crew in topgallant forecastle. The steamer is specially constructed for the wine trade and has three tiers of beams; steam winches by Messrs. Clarke, Chapman & Co.; patent windlass by Messrs. Emerson & Walker; steam steering gear by Messrs. Donkin and Nichol; and Blake's patent donkey boiler, together with the usual fittings of a first-class steamer. The machinery is by Messrs. Black, Hawthorn & Co., of Gateshead-on-Tyne, of the tri-compound type, having cylinders 19 in., 31 in., and 51 in. diameter respectively by 36 in. stroke. Steam will be supplied from two large steel boilers working at a pressure of 160 lbs. per square inch. During construction all details of both hull and machinery have been superintended by Captain Caws, representing the owners. Upon leaving the ways the vessel was named *Denia*.

**Coomassie.**—On Saturday, February 22nd, the Naval Construction & Armaments Co., of Barrow, launched from their yard the steamer *Coomassie*, built to the order of Messrs. Elder, Dempster & Co., of Liverpool. The vessel is of steel and is 311 ft. 6 in. long, 89 ft. beam, 24 ft. 7 in. deep, and is fitted with Emerson, Walker & Co.'s combination windlass. The *Coomassie* is in every respect similar to the *Soudan*, built for the same owners, and *Matidi* and *Boma*, which were built to the order of the British and African Steam Navigation Co. by the same builders some few months ago.

**Tasso.**—On February 24th Earle's Shipbuilding and Engineering Co., Limited, Hull, launched the *s.s. Tasso*, which has been built by them for Messrs. Thomas Wilson, Sons & Co.'s general passenger and cargo service, to the following dimensions:—Length, 250 ft.; breadth, 32 ft.; depth of hold, 16 ft. 6 in. She is arranged with long full poop and topgallant forecastle, and accommodation is provided amidships under the poop for 28 first-class passengers, with dining saloon, promenade deck, smoke-room, chart-room, &c., above, all fitted up in polished woods in a good substantial manner; and there is a cabin aft for eight second-class passengers. The remainder of the 'tween decks is adapted for the conveyance of emigrants. The officers' quarters are on the poop amidships, and those of the crew are in the forecastle. Water-ballast is provided for in the engine and boiler space and fore and after peaks. The ship is schooner-rigged, with polemasts. She has steam steering gear fitted amidships, and hand-screw gear aft; good cargo capacity combined with fine lines for speed; and she has efficient appliances for the rapid working of the cargo. After launching, the vessel was towed round to the Albert Dock to receive her machinery, which is on the triple-expansion principle, and has been made by Messrs. Amos & Smith, of Hull.

#### LAUNCHES—SCOTCH:

**Rostrevor.**—On January 23rd Messrs. John Fullarton & Co. launched from their Merksworth Building Yard, at Paisley, an iron screw steamer named *Rostrevor* of 200 tons gross, built by them to the order of the Newry and Kilkeel Steamship Co., Limited, Newry, and intended for the coasting trade. Mr. William Kemp, Govan has constructed for her, compound surface-condensing engines of 45 H.P. The cylinders are 16 in. and 32 in. in diameter, and the stroke 22 in. Steam is to be generated in one boiler 10 ft. in diameter and 9 ft. 6 in. stroke, having two furnaces, and working to a pressure of 90 lbs. to the square inch.

**Pleneta.**—On February 1st a twin-screw steamer, built of steel, by Messrs. Archibald McMillan & Son, was launched from their dockyard at Dumbarton. This vessel, which is named *Pleneta*, and is intended for the Brazil coasting trade, is of the following dimensions:—Length, 260 ft.; breadth, 34 ft.; depth, 20 ft. 4½ in.; and the register tonnage is 1,500 tons gross. Engines of the triple-expansion type are being fitted on board by Messrs. Matthew Paul & Co., Dumbarton, and are designed to give the vessel a speed of 12 knots an hour.

**Bellagio.**—On February 4th Messrs. David & William Henderson & Co. launched from their Meadowside shipbuilding yard, at Partick, a steel screw steamer named *Bellagio*, and built for Messrs. Bell Brothers & McLellan, Glasgow. The steamer, which is designed to carry 6,000 tons deadweight, is of the following dimensions:—Length, 360 ft.; breadth, 46 ft.; depth, 29 ft. 6 in. Engines of the tri-compound type are being fitted on board by Messrs. Henderson. They are to indicate 2,500 H.P.

**Strathgryfe.**—On February 5th Messrs. Russell & Co. launched from their Kingston Yard at Port-Glasgow a four-masted steel barque, named *Strathgryfe*. Dimensions:—Length, 270 ft.; breadth, 42 ft.; depth, 24 ft. 6 in.; 2,200 tons net register; to carry 3,600 tons cargo on Lloyd's freeboard, and she is fitted with Emerson, Walker & Co.'s patent capstan windlass. This vessel is built to Lloyd's highest requirements, and is for Messrs. J. & W. Stewart, Greenock. After the launch the vessel was towed to the James Watt Dock to fit out. Messrs. Russell & Co. will put down the keel of a vessel of similar dimensions on the vacant ways.

**Palamcottia.**—On February 6th Messrs. A. & J. Inglis launched from their yard at Pointhouse, Glasgow, a steamer built by them for the British India Steam Navigation Co. The vessel, which is named *Palamcottia*, is of 4,000 tons gross, her dimensions being 360 ft. long; breadth, 42 ft.; and depth, 29 ft. 3 in. She will be fitted with hydraulic gear for loading and discharging cargo, and will be lighted throughout by electricity. Accommodation for 36 first-class and 20 second-class passengers has been provided. The engines, which are of the triple-expansion type, are to indicate 3,000 H.P.

**Alderman Readhead.**—On February 6th Messrs. Marr Bros. launched a steam line-fishing boat 76 ft. long, 17 ft. broad, and 9 ft. 6 in. deep. The vessel, which has been built to the order of Mr. T. R. Readhead, South Shields, will be engined by Messrs. Brand & Co.

**Simon Dumois.**—On February 8th the Grangemouth Dockyard Co. launched from their shipbuilding yard, at Grangemouth, a handsomely-modelled steel screw steamer named *Simon Dumois*. Dimensions:—180 ft. by 28 ft. by 19 ft. 8½ in. to awning deck. She is the first of six steamers at present being built by the Dockyard Company for the fruit trade between the West Indies and America, for which trade she has been specially designed. She is handsomely fitted up for a number of passengers, and has all the latest improvements for working both ship and cargo. The engines, which are of the triple-expansion type, are being supplied by Messrs. Hutson & Corbett, of Kelvinhaugh Engine Works, Glasgow, and are expected to drive the vessel at a high rate of speed. The vessel has been built under the special survey of Norwegian Veritas and Captain Kunitz on behalf of the owners.

**Normannia.**—On February 10th (Sunday), the new Hamburg-American liner *Normannia* was launched from the yard of the Fairfield Shipbuilding and Engineering Co., at Govan. The intention of the builders was to have launched her on Saturday, and a very large company had been invited to the ceremony, but at the last moment it was found impossible to proceed, owing to the very dense fog which hung over the river. The attendance on Saturday was very large, and amongst those present were Sir James Bain and Miss Bain, the lady who was to have performed the christening ceremony. In deciding to launch the vessel on Sunday, the builders certainly followed an unusual course, but there was really no alternative. A month might have elapsed before the tides were again suitable for launching so large a vessel, and in waiting there was grave danger, for the vessel in the position she was might at any time have slipped unexpectedly into the water. There was no ceremony on Sunday. The public were rigorously excluded from the yard, almost all the persons present having some sort of connection either with the owners or builders. The launch was nevertheless witnessed by an unusually large number of people, the north bank of the river from Meadowside westward affording accommodation to thousands of spectators. The *Normannia* has been built to the order of the Hamburg-American Steam Packet Co., and is the largest mercantile steamer the Fairfield Company have ever constructed. Her gross tonnage is 8,500. Her dimensions are:—Length, 500 ft.; breadth, 57 ft. 6 in.; depth, moulded, 38 ft. When completed she will have all the outward evidences of great steaming power. There will be three funnels, and only two polemasts, carrying a minimum of canvas. These will all have a long rake, giving the vessel a smart look in spite of her straight stem. The stern is elliptical, with a poop, having a turtle-shaped deck. The space between the upper and promenade decks is left open, affording a sheltered promenading passage around the long row of saloons and cabins on the upper deck. In addition to the promenade deck (400 ft. in length) there are four decks—the upper, main, lower, and orlop. Accommodation is provided for 428 first-class, 170 second-class, and 700 steerage passengers. The ladies' saloon and music-room are on the promenade deck forward. They are to be treated in the Renaissance style, and will be magnificently furnished. Between them is a large well with a cupola of stained glass, giving light to the principal dining-saloon on the upper deck. Entrance is through a vestibule with finely-carved companion-way. The dining-saloon is 72 ft. long, and occupies the whole breadth of the ship, excepting the width of outside passages on either side. On the deck below there is an auxiliary dining-saloon, so that 380 first-class passengers may dine at the same time. The first-class smoking-room is aft on the promenade deck, and will be 44 ft. wide by 20 ft. long. It is to be treated as an old-fashioned wine-house, and will afford extensive opportunity for a display of realistic art. The second-class and steerage accommodation is fitted abaft the machinery and on the lower deck respectively, and is in every way in keeping with the other appointments of the ship. The captain and chief officers have state-rooms on the promenade deck. On the orlop deck are the mail-rooms, provision and store rooms, ice-house, &c. There is a complete installation of electric light. The speed guaranteed is 19 knots an hour, which is less than the Atlantic record of the *City of Paris*, but the possibilities

of the new vessel exceeding the guaranteed rate are great. Her propelling machinery is designed to develop at least 14,000 I.H.P., and, as in the most recent Atlantic liners, twin screws have been adopted. The propeller bosses are of steel, while the blades, of which there are three on each, are of manganese bronze. The engines are of the triple-expansion type, with cylinders of 40 in., 67 in., and 106 in. diameter respectively, with a stroke of 5 ft. 6 in. The shafting, made by John Brown & Co., Sheffield, is of steel throughout. She is fitted with Emerson, Walker & Co.'s patent steam windlass, and by the same firm twin steam warping capstans on after deck. Steam is supplied from nine double-ended steam boilers, each 16 ft. by 18 ft., which work at a pressure of 160 lbs.

**Alfred Dumois.**—On February 11th Messrs. Blackwood & Gordon, engineers and shipbuilders, launched from their shipbuilding yard, at Port-Glasgow, a handsome steel screw-steamer named the *Alfred Dumois*, intended for the fruit trade between America and the West Indies. Dimensions:—175 ft. by 28 ft. by 19 ft. 10 in. to awning deck. Her machinery is of the triple-expansion type, with Merton's patent valve gear, and all the latest improvements, also made by the builders. The engines will indicate 800 H.P., and are expected to drive the vessel at a good rate of speed. Handsome accommodation has been provided for 16 first-class passengers, and every attention has been given to the fittings and ventilation of cabins, so as to ensure the comfort of passengers travelling. The steamer has been built to the order of Mr. Jacob Christensen, of Bergen, Norway, to the highest class at Lloyd's, and has been inspected by Mr. Hugh M'Intyre, marine surveyor, Glasgow, assisted by Captain Reimers, the owner's superintendent.

**Nanchang.**—On February 12th there was launched from the yard of the London and Glasgow Engineering and Iron Shipbuilding Company, Limited, a steel twin-screw steamer named *Nanchang*, built to the order of Messrs. John Swire & Sons, London, for the China Steam Navigation Company. The vessel, which is constructed especially for the China coasting trade, is 255 ft. by 36 ft. by 23½ ft. depth of hold, with a gross tonnage of about 1,750 tons. The engines are triple-expansion and of about 1,600 I.H.P.

**Netherby Hall.**—On February 17th Messrs. Caird & Co., Greenock, launched a steel screw-steamer, named *Netherby Hall*, for Messrs. R. Alexander & Son, Liverpool. Her dimensions are:—Length, 350 ft.; breadth, 42 ft.; depth, 29 ft. 9 in.; and of 3,250 tons gross. The builders will supply triple-expansion engines of 2,000 I.H.P. The steamer has been built under special survey, is classed 100 A 1 at Lloyd's, and she is to be engaged in the general cargo trade. This is the third vessel built for the same company during the past twelve months.

**Pilcomayo.**—On February 17th Messrs. Murdoch & Murray launched from their shipbuilding yard at Port-Glasgow a steel twin-screw steamer of the following dimensions:—Length, 160 ft.; breadth, 33 ft.; depth, 9 ft.; gross tonnage, 430 tons. This vessel is intended for South America trade, is for London owners, and is the first of two steamers the builders have in hand for the same firm. On leaving the ways the vessel was named *Pilcomayo*, and immediately after the launch was taken in tow for Greenock, where her machinery—consisting of two sets of triple-expansion engines, cylinders 9 in., 18 in., 32 in. by 22 in. stroke, 150 H.P.—will be fitted on board by Messrs. Rankin & Blackmore. During construction the vessel has been under the supervision of Messrs. Morton & Williamson, Glasgow.

**Circassie.**—On February 19th a steel-screw steamer named *Circassie* was launched from the yard of Messrs. Gourlay, Brothers & Co., Dundee, for Messrs. Paquet & Co. Marseilles. The *Circassie*, which has been built to the highest class of the Bureau Veritas, is of the following dimensions:—Length, between perpendiculars, 315 ft.; breadth, moulded, 37 ft. 6 in.; and depth, moulded, 25 ft.; while she is 1,448 tons net, and will carry about 2,000 tons of cargo. Her engines are of the triple-expansion type, having cylinders of 25 in., 40 in., and 64 in., with a stroke of 45 in. The vessel is built on the cellular double-bottom principle for water-ballast, and is provided with two complete steel decks, with three tiers of beams in addition, the weather-deck being sheathed with wood. She has six watertight bulkheads, and four hatches for working the cargo,

and is fitted with four steam winches, steam windlass for the anchors, and steam steering gear by Amos & Smith. She has accommodation for 24 first-class passengers in state rooms under the poop deck, while there is accommodation for a similar number of second-class passengers in the 'tween decks forward, the quarters for the captain, officers, doctor, &c., being provided amidships, underneath the bridge, on which is the chart-house. The first-class saloon is a spacious apartment, occupying the whole width of the vessel, and over it, also on the poop deck, is a smoking-room. The vessel has been built under the superintendence of Capt. Bouille, and she is to trade between Marseilles and the Black Sea. The Messrs. Gourlay have at present two other vessels on the stocks, the one being a passenger steamer named the *Hirondelle*, for the General Steam Navigation Co., and the other being a steamer 435 ft. long, and 6,000 tons, the largest yet built in Dundee for the National Line, Liverpool.

**Otra.**—On February 19th there was launched from the yard of Messrs. S. & H. Morton & Co., Leith, a steel screw steamer, built to the order of Messrs. Charles Salvesen & Co., Leith, for Norwegian owners. The dimensions of the vessel are 190 ft. by 30 ft. by 15 ft. 9 in., having a large cargo capacity, and good accommodation for passengers. The vessel will be fitted by the builders with triple-expansion engines, cylinders 14 in., 23 in., and 37 in. diameter, by 80 in. stroke. On leaving the ways the vessel was named the *Otra* by Mrs. Thomas Salvesen, Edinburgh.

**Mayhill.**—On February 20th a four-masted barque, built on beautiful lines, was launched from the yard of Messrs. Alexander Stephen & Sons, Linthouse, Glasgow. As the vessel was leaving the ways she was named the *Mayhill*, by Miss Thompson, a granddaughter of the builders. The *Mayhill* has a net tonnage of about 2,050 tons, and is of the following dimensions:—Length, 292 ft.; breadth, 41 ft.; and depth, 23 ft. 9 in. She has been built partly of steel and partly of iron, and in her construction all the latest improvements have been introduced. She is owned by Messrs. W. J. Myles, Son & Co., Liverpool, and will be engaged in the Australian trade of the firm. Captain William Brown, who is at present on his way home from San Francisco in the same company's vessel *Swanmore*, has been appointed to command the *Mayhill*.

**Benares.**—On February 20th there was launched from the shipyard of Messrs. Barclay, Curle & Co., Limited, Whiteinch, Glasgow, the finely-modelled steel screw steamer *Benares*. This vessel is an addition to the fleet of the Hamburg-Calcutta Line, and is intended to trade between Hamburg and Indian ports. The vessel, which has a moderate amount of passenger accommodation, is to be completely lighted by electricity, and furnished with a Suez Canal electrical navigation light. Her dimensions are 340 by 43.3 by 29 ft., and will measure 3,010 tons gross. After the launch the vessel was towed to the harbour to be fitted with her engines, which are being supplied by the builders, and are constructed on the triple-expansion principle, with cylinders and boilers which will develop 2,500 H.P.

**Bankburn.**—On the 21st February there was launched from the Kellybank Shipbuilding Yard, Alloa, by the Grangemouth Dockyard Co., a steel barque, being the sixth vessel built at Alloa since work was begun at the yard. The new barque was named the *Bankburn*, and was built to the order of Messrs. Just & Co, Liverpool, to whose order the firm recently built the barque *Bankholme*. The dimensions of the *Bankburn* are:—Length, 250 ft. by 37 ft. 6 in. in breadth, moulded, by 21 ft. depth of hold. The registered tonnage is 1,400, and the vessel will carry a deadweight of 2,800 tons. The ship is built to Lloyd's highest class.

**Cygnos.**—On February 21st Messrs. David J. Dunlop & Co. launched from Inch Works, Port-Glasgow, the s.s. *Cygnos*, built by them to the order of Messrs. Fraissinet & Co., of Marseilles. The dimensions of the new steamer are in length 225 ft.; breadth, 29 ft.; and depth, moulded 23 ft. 4 in. to awning deck. The new steamer has been built under special survey to the highest class in the Bureau Veritas as a hurricane-decked vessel. Passenger accommodation is provided on the main deck for first, second, and third class passengers, on which deck are also placed the officers, engineers, and crew's quarters. A spacious lower deck is fitted forward for sheltering deck passengers. Every attention has been paid to the

lighting and ventilation of all parts of the ship, so as to secure the utmost comfort to passengers in the Mediterranean service, for which the steamer has specially been built. The engines, which will be fitted on board at the builders' wharf, are of the three cylinder type, and will develop about 1,700 I.H.P.; they are fitted with Morton's patent valve gear, and are expected to give the steamer a high rate of speed. The steamer has been built under the inspection of Captain Lacotte, the commander of the vessel, and Mr. Lautier, superintending engineer for the owners. As the vessel left the ways she was named *Cygnos* by Miss Dunlop, Athole Place, Glasgow.

**Heung Shan.**—On February 22nd there was launched from Messrs. Ramage & Ferguson's yard at Leith, a large twin screw passenger steamer, built to the order of the Hongkong Canton and Macao Steamboat Co., for their service between Hongkong and Macao. On leaving the ways the vessel was named the *Heung Shan*, by Miss Darnell, Cargilfield House, Trinity. Her principal dimensions are:—Length over all, about 800 ft.; breadth, extreme, 54 ft.; and depth to upper deck, 28 ft. 6 in.; the propelling power being supplied by two powerful sets of triple-expansion engines, adapted for a very high rate of speed, on a light draught of water. The gross tonnage of the *Heung Shan* is about 2,500 tons; and her passenger accommodation will be of the most extensive description, and includes lofty tweendecks for third-class native Chinese; spacious separate saloons for first-class Chinese and Parsees; besides cabins for a large number of first-class European passengers; all fitted up specially for Eastern trade requirements. Although only a small amount of cargo is to be carried, four holds have been adapted for this department, besides fire-proof specie, and opium compartment. The *Heung Shan* is a somewhat similar but larger and much faster steamer than the s.s. *Fatshan*, built by Messrs. Ramage & Ferguson about two years ago for the same company, and now well known in the China trade as one of the most favourite passenger steamers on the coast.

**Strathesk.**—On February 22nd Messrs. Russell & Co. launched from their Greenock Yard a steel screw steamer called the *Strathesk*, built to the order of Messrs. Burrell & Sons, Glasgow, and to be engaged in their general carrying trade. Dimensions:—Length, 290 ft.; breadth, 38 ft.; depth, 22 ft. 1 in.; gross tonnage, 2,390; deadweight carrying capacity, 3,600 tons. Messrs. Howden & Co., Glasgow, will supply triple-expansion engines of 1,100 I.H.P.

**Cornelian.**—On February 22nd there was launched from the shipbuilding yard of Messrs. Scott & Co., Bowling, a screw steamer of 450 tons deadweight, named the *Cornelian*, built to the order of Mr. William Robertson, 88, Great Clyde Street, Glasgow, and intended for his general coasting trade. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Kinning Park, Glasgow.

**Bannes.**—On February 22nd a screw steamer named the *Bannes* was launched from the Kellybank Shipbuilding Yard, Alloa. The christening ceremony was performed by Mrs. Kieding, wife of Captain Kieding, under whose superintendence the vessel has been built. Dimensions:—Length, 180 ft.; breadth, 28 ft.; depth of hold, 12 ft. 9 in. The vessel has been built to the highest class of Norwegian Veritas, and is intended for the American fruit trade. The owners are Messrs. Harloff & Boé, Bergen.

**Kasara.**—On February 22nd the Ailsa Shipbuilding Co. launched from their yard at Troon a steel screw steamer named the *Kasara*, of the following dimensions: 240 ft. by 34 ft. by 25 ft., moulded to shade deck, for the British India Steam Navigation Co., Limited. She is fitted with accommodation for first-class passengers in poop aft, and for second-class passengers and officers in bridge-house amidships, and has topgallant forecabin forward for crew and offices for native passengers. She will be schooner-rigged, and is fitted with steam steering gear, steam windlass, and all the latest appliances for working ship and cargo, and an installation of electric light throughout. Messrs. Dunsmuir & Jackson are supplying the machinery, which is to be of large power, and the vessel is intended to attain a high rate of speed.

## LAUNCHES.—IRISH.

**Lake Fisher.**—On February 6th a four-masted schooner was launched from the shipbuilding yard of Messrs. M'Ilwaine & M'Coll, of Belfast. The schooner was built for Messrs. Thomas Fisher & Sons, Barrow-in-Furness, being specially designed and fitted for the trade in which she will be engaged between Liverpool and Buenos Ayres. The vessel is 145 ft. long between perpendiculars; her breadth is 25 ft. 6 in., and the depth to the top of the floors 10 ft. 9½ in. When launched she was completely fitted out and ready for sailing, and was immediately taken possession of by her captain and crew.

**Saint Pancras.**—On February 8th there was launched from the yard of Messrs. Harland & Wolff, Belfast, this steamship for Messrs. Rankin, Gilmore & Co., Liverpool. The dimensions of the vessel are:—Length, 400 ft.; breadth of beam, 45 ft.; depth of hold, 32 ft.; gross tonnage, about 4,000. Very powerful triple-expansion engines are being supplied.

**Alexander Elder.**—On February 11th there was launched from the works of Messrs. Harland & Wolff, Belfast, the screw steamship *Alexander Elder*, built for Messrs. Elder, Dempster & Co., Liverpool. She is 400 ft. long, 45 ft. breadth of beam, 32 ft. depth of hold; gross tonnage about 4,000. She is fitted with triple-expansion engines, and boilers capable of carrying a pressure of 160 lbs.

**California.**—On February 22nd Messrs. Harland & Wolff launched from their yard at Belfast the steel screw steamer *California*, a vessel of 3,007 tons register. Her dimensions are 329 ft. 3 in. by 45 ft. 2 in. by 26 ft. 7 in. The boat has been constructed to the order of the North-Western Shipping Co., of which Messrs. Ismay, Imrie & Co. are the managing owners. She is intended for the San Francisco trade, has four masts, and is built on the principle of the White Star liners.

## LAUNCH.—DANISH.

**Marie.**—On January 18th the screw steamer *Marie* was launched from the yard of Messrs. Burmeister & Wain, Copenhagen. She is built for the Danish State Railways, and is particularly intended for winter traffic. She is built of steel, 140 ft. long and 81½ ft. broad; she has two compound engines and two propellers, and is in most respects a sister ship to the *Waldemar*, built at the same yard for the Danish State Railways.

## LAUNCH.—NORWAY.

**Britannia.**—On January 23rd there was launched from the yard of Laxeavags, Maskin & Jernskibsyggeri, Bergen, Norway, the s.s. *Britannia*. Her dimensions are as follows:—Extreme length, 275 ft.; length between perpendiculars, 245 ft.; extreme breadth, 34 ft. She is to have triple-expansion engines from Messrs. Napier, Shanks & Bell, and four boilers. The vessel is to be fitted out in a first-class style for the passenger and mail traffic between Newcastle and Bergen. The owner of the *Britannia*, Mr. P. G. Halvoren, has already for some years had another steamer, the s.s. *Norge*, running in this line.

## TRIAL TRIPS.

**Ald.**—This vessel has just been handed over to the Board of Trade by her builders, Messrs. William Allsup & Sons, Limited, of Preston, and went through her final trials on Friday, the 17th January. She is a handsome looking vessel, designed for the Board's own service at Ramsgate. She is fitted with two pairs of compound surface-condensing oscillating engines, so that either paddle wheel may be driven independently of the other. The cylinders are 18 in. and 36 in. diameter by 48 in. stroke, and she is worked to a pressure of 100 lbs. per square inch. There is a separate Worthington circulating pump, and her valve gear is W. Sisson's patent lever valve motion for oscillating engines. She is fitted with two sets of Brown's patent hydraulic starting gear; she has two boilers, with four Fox's patent corrugated flues placed fore and aft of the engines. The arrangement of the engine-room is such that there is good accommodation for working the engines on the platforms, which are well protected from the weather and seas. The ship is built of steel, 126 ft. long by 21 ft. beam by 10 ft. depth of hold. She is very strong and of substantial construction, double bowed, steering either way, with a rudder in each bow. The steering is effected from the steering-house over the

engine-room, in which are placed two substantial steam steering gear (Amos & Smith's), which can be worked either separately or together by means of a clutch gear. Each bow is fitted with self-housing anchors, cables and steam capstan, the engine of the capstan being snugly arranged below the deck. There is a turtle-back deck over each bow to protect the men while working the anchors in a sea way. There is a large bridge-house extending over the engines and beyond the funnels. She has towing gear fitted for each end, so that she can tow in either direction. Besides these fittings the vessel is arranged with a powerful Worthington steam fire pump, having two 12 in. cylinders by 12 in. stroke, capable of throwing two 1½ in. jets of water through 300 ft. of hose to a very great height. This pumping engine also acts as a salvage pump, having a sufficient amount of india-rubber hose of 6 in. bore to be laid to any vessel which might be leaking, or full of water and require pumping out. The trials were effected from Ramsgate harbour round the Goodwin Sands and back. There was a strong breeze and some sea. She made the run of 32 knots in the face of the wind and foul tide under three hours, and the trials were considered by all on board to be most highly satisfactory in every respect. As will be seen, the *Ald* is an unique vessel of her type, and she will prove of most invaluable service on her station. The designs are those of the Board of Trade and Messrs. Wm. Allsup & Sons, Limited, who made the machinery as well as the hull, and have carried out the designs in a most careful and substantial manner.

**Nidaros.**—On January 24th the official trial of the s.s. *Nidaros* took place between Clooh and the Cumbrae Lights, on the Firth of Clyde. The *Nidaros* is a small passenger steamer, built by Messrs. Lobnitz and Co., Renfrew, for the United Steamship Co., Copenhagen, for their Norwegian trade. With this latest addition to their fleet the company owns 100 vessels. The *Nidaros* is 190 ft. long by 29 ft. beam by 16 ft. 6 in. depth of hold, and carries 600 tons cargo and 30 first-class passengers. The trial was in every way a success, and the vessel left the Clyde for Copenhagen after the trial trip.

**Nautilus.**—On January 25th the s.s. *Nautilus*, of Cape Town, built by Messrs. J. M'Arthur & Co., Paisley, went down the Clyde on her trial trip, and, notwithstanding the strong gale which was blowing, attained half a knot over stipulated speed on measured mile. The *Nautilus* is a vessel of 360 tons, spar-deck type, and is fitted with surface-condensing engines, 350 H.P.; has accommodation for 40 first-class passengers, and is fitted 'tween decks for cattle. She has been built to order of Messrs. Webster, Cape Town, under the supervision of Captain Hanzon, who is their representative here.

**Lady Torfrida.**—On January 25th the handsome new auxiliary steam yacht, built by the Fairfield Co. for Sir William George Pearce, Bart., went down the Clyde for her trial trip previous to leaving for the south. The latest *Lady Torfrida* is 166 ft. long, 27 ft. beam, and 17 ft. depth, moulded, and is of 540 tons yacht measurement. Her rig, which is that of a barquentine, gives her a very handsome appearance, and will fit her admirably for cruising without the aid of her engines. The latter are of a triple-expansion type. The propeller is arranged to feather so that when the yacht is cruising under sail it will offer the least possible resistance to the water. The rudder is controlled by both steam and hand steering gears, and a powerful steam capstan is fitted forward for working the anchor cables. The internal arrangements of the *Lady Torfrida* are very complete, and compare favourably with her former namesakes.

**James Speir.**—The *James Speir* came round to the Tyne from Stockton on January 27th, in the face of the strong N.W. gale, took in a cargo of coals for Caen, and on the 31st had her trial on the measured mile fully laden, when she averaged nine knots per hour, a highly satisfactory performance, the engines working with perfect smoothness. The *James Speir* has been built by Messrs. R. Craggs & Sons, of Stockton, and is 165 ft. long, by 26½ ft. beam, by 12½ ft. deep, with R.Q.D. and T.G.F. The engines are by Messrs. E. Scott & Co., of Newcastle, and are of the triple-expansion type, with 12 in., 20 in., and 32 in. by 27 in. stroke. The vessel has been superintended by Mr. T. M'Nabb, and the engines by Mr. H. B. Buckland, both of Newcastle, on behalf of the owners, Messrs. Lancaster, Spred & Co., of London, Newport, and Cardiff.

**Ville de Douai.**—On January 29th the tank steamer *Ville de Douai*, recently built by Sir W. G. Armstrong, Mitchell & Co., was tried at sea. The vessel is capable of carrying 2,400 tons deadweight on less than 18 ft. draught of water. The *Ville de Douai* is built of steel, and has been specially designed for the carriage of crude petroleum in bulk. The machinery is of the triple-expansion type, and made by the Wallsend Slipway and Engineering Co. Although there was a very heavy sea running during the trial, a mean speed of 11 knots was attained.

**Oswin.**—On January 31st this steamer, 259 ft. by 37 ft. by 18 ft., built by Messrs. Turnbull & Son, Whitby, for Turnbull Partners, Cardiff, left the Tees for her trial trip. Her engines are of the triple-expansion type, of 140 N.H.P., having cylinders 20 in., 33 in., and 54 in. diam. by 36 in. stroke, and working at 160 lbs. pressure, and have been built by Messrs. Blair & Co., Stockton-on-Tees. She made a successful run, everything working first-class. The vessel attained a speed of about 10½ knots,

**Malange.**—On February 4th the steel screw-steamer *Malange*, built and engined by Messrs. Scott & Co., Greenock, for the Mala Real Portuguese Co., Lisbon, went down the Clyde on her trial trip. Amongst the company on board were Messrs. John Scott, C.B., Robert Sinclair Scott, Captain Tomassinie (representative of the company), Snr. Diaz (Government engineer), Captain Nuniel, &c. The *Malange* is the last of five steamers built by Messrs. Scott & Co. for this company for trading between Lisbon and the Portuguese African colonies. Her dimensions are: Length between perpendiculars, 350 ft.; breadth, moulded, 42 ft.; depth, 28 ft. 6 in.; gross tonnage, 3,543; net register, 2,409; displacement, 5,300 tons. The vessel is built with a spar deck, a long bridge-house, with saloon amidships, clipper bow, elliptic stern, and rigged as a schooner. She has a cellular double bottom, with water ballast of 420 tons fore and aft, and on trial she ran with a draught of 21 ft. aft. There is accommodation for 75 first-class, 55 second-class, and 320 third-class passengers; besides separate compartments for 12 convicts, and accommodation for 240 troops in the 'tween decks forward, while arrangements have been made for carrying six guns, so that the steamer may be utilised as an armed cruiser. The vessel has been built to 100 A 1 at Lloyd's, on the three-decked class, under special survey, and she also complies with all the requirements of the Portuguese Government. Two centrifugal circulating pumps are on board, with independent engines, supplied by Messrs. John & Henry Gwynne, of London. The electric light is fitted throughout the ship by Messrs. Parsons & Co., Newcastle-on-Tyne. A refrigerating chamber has been placed in the after and 'tween decks, while the Bell-Coleman refrigerator has been fitted in the engine-room, with all the necessary pipes and accommodation. The *Malange* is also supplied with four steam windlasses, two steam cranes, steam steering gear by Messrs. Hastie, Greenock; Sir Wm. Thomson's compass and sounding machine, and compasses by Messrs. Walker & Son, Greenock; and the upholstery by Messrs. J. G. Rowan & Co., Greenock. The engines are a set of inverted direct-acting triple-expansion engines, constructed for a working pressure of 160 lbs. to the square inch, and of 4,000 I.H.P.; the cylinders, 31 in., 50 in., and 80 in., with a stroke of 4 ft. 6 in. There are three steel boilers, two double-ended and one single-ended, with 15 furnaces. The trial trip on February 4th was quite successful, the vessel on a six hours' run attaining a mean speed of 15 knots per hour, which is half a knot over the guaranteed speed.

**Speedwell.**—On February 4th the *Speedwell*, a torpedo gun-boat of the *Seagull* class, which recently arrived at Portsmouth from Devonport, went out of harbour for the first of a progressive series of steam trials under forced draught. The vessel differs from her sister ships in being structurally stronger, and slight differences have been made in the engines and boilers. There was much less vibration during the trial than in the other vessels of the class, but as regards the engine trials there was no break in the monotony of failure. The *Speedwell* made a satisfactory run round from the west, but in cooling so many leakages were developed in the boiler tubes that it was necessary to repair about 200 of them in the dockyard before proceeding on trial. The contract power of the engines with closed stoke-holes is 4,500 horses, but it was not intended to press them to 8,500, that being about the power at which weakness is likely to have manifested itself at previous runs of the *Seagull*. After

the engines had been slowly worked up to the desired number of revolutions, the three hours' trial was begun with an air pressure of 1½ inch, but it was soon perceived that it was unlikely that the reduced power would be realised. When the trial had proceeded to within five minutes of the specified three hours' steaming, the tubes of the two boilers leaked to such an extent that nothing further could be attempted. The trial was abandoned, and the vessel returned into harbour.

**Carnot.**—On February 5th the trial trip of the s.s. *President Carnot* took place over the measured mile at Long Reach in the Thames. She has been constructed by Messrs. Edwards & Symes, of Millwall, London, for the grain and timber trade of the River Plate. Her dimensions are:—Length, 175 ft.; beam, 27½ ft.; depth, 9 ft., and fitted by the builders with compound surface-condensing screw engines of 300 I.H.P., having cylinders 18 in. and 36 in. diameter, with a stroke of 22 in.; one steel boiler with two furnaces, and constructed for a working pressure of 110 lbs. per square inch. With 700 tons on board the draft of water is only 8 ft., and her speed on trial 8½ knots per hour. The machinery during the four hours' trial worked, we are informed, in the most satisfactory manner, maintaining a vacuum of 28 in., and the owners expressed themselves highly pleased with the results obtained and the satisfactory manner in which the contract had been carried out. This is the second vessel built by Messrs. Edwards & Symes for the same destination and trade. The War Department have contracted with Messrs. Edwards & Symes to build a twin-screw store vessel for Portsmouth, of the following dimensions:—Length, 112 ft.; beam, 21 ft.; depth, 9 ft. She is to be fitted with compound surface-condensing engines, with all modern improvements.

**Latona.**—On February 8th this steel screw steamer, built by Messrs. Russell & Co., Port-Glasgow, was taken on her trial trip. Her dimensions are:—Length, 323 ft.; beam, 42 ft.; depth, 23 ft. 6 in.; and she had a full cargo on board. Two runs were made on the measured mile on the Clyde, the speed obtained being 10½ knots, and the machinery worked very smoothly at 72 revolutions. The engines, which are by Messrs. Dunsinuir and Jackson, of Govan, have cylinders 24 in., 39 in., and 64 in. diameter, with a stroke of 45 inches, and have been built under the superintendence of Messrs. Flannery & Blakiston, of Liverpool and London. The boilers are extra large, double-ended, and gave ample steam on the trial. The vessel is owned by Mr. J. M. Steeves, of Liverpool, and will proceed to Bombay.

**Lantaro.**—On February 10th the Sud Americana steamer *Lantaro*, which has been refitted with triple-expansion engines by Messrs. John and James Thomson, ran her trial trip on the Firth of Clyde. The machinery worked with every satisfaction, and after adjustment of compasses the *Lantaro* proceeded for Liverpool. The *Lantaro* is a somewhat well-known steamer on the west coast of South America, having had a good share in the Chilean war.

**Victory.**—On February 11th the screw steamer *Victory*, the latest addition to the fleet of the Marquis of Londonderry, left Bill Quay for a trial trip. The vessel has been built specially for the coal trade between Seaham and London, and is arranged to pass through the bridges on the Thames. She is a vessel of the following dimensions:—Length, 185 ft.; breadth, 30 ft.; draught, 12 ft. 6 in. The main engines have been built by the North-Eastern Marine Engineering Co., Wallsend, and are of the triple-expansion type. On the trial the vessel attained a speed of 10½ knots. During the trial, which was made in a rough sea, everything worked without a hitch, and gave every satisfaction.

**Jarnac.**—On February 14th the trial trip of the *Jarnac* (s), recently built by Messrs. S. & H. Morton and Co., Leith, for Messrs. Thos. and J. W. Harrison, Liverpool, took place in the Firth of Forth. The owners were represented by Mr. Thos. Hughes and Mr. Cadman, the superintending engineer. After adjusting compasses, a run was made to the Forth Bridge, back to Leith Roads, the vessel and machinery giving every satisfaction. Gill's patent boat-lowering apparatus has been fitted on board, and on trial was found to work most efficiently. The vessel will be commanded by Captain Aiken, who has been over 20 years in the service.

## Reviews.

**Kilmore.**—This steamer, the latest addition to the Johnston-line, has been built by the Edwards Shipbuilding Co., Howdon-on-Tyne. Her dimensions are:—Length 287 ft.; beam, 38 ft.; with 18 ft. depth of hold. She has a deadweight capacity of 2,700 tons. The *Kilmore* has been fitted with triple-expansion machinery, to the specification of Messrs. William Esplin & Son, by the firm of Messrs. David Rollo & Sons, Fulton Engine Works. The vessel went on her official trip on February 15th, after being fully loaded. The machinery was tested carefully and gave every satisfaction, both in handling and power. After the trial the vessel proceeded on her voyage, and the company returned to the landing-stage by the tender.

**La Campine.**—On February 15th the trial trip of the *La Campine*, a steel screw steamer, built by Messrs. Palmer & Co., Jarrow, took place. The vessel has been built for Mr. E. Speth, Antwerp, and is intended for the petroleum trade. She measures 310 ft. long, 39 ft. broad, and 27 ft. 6 in. deep. A speed of 10½ knots an hour was attained on the measured mile, the engines working regularly and smoothly.

**Weimar.**—On February 17th the steamer *Weimar*, which was recently launched by Messrs. Ramage & Ferguson for Messrs. James Currie & Co., went on her trial trip on the Firth of Forth, with a company which included Mr. Ferguson, representing the builders; Mr. List, London; Captain Ritchie, superintendent for the owners; Captain Thomas, who is to command the vessel, and others. After adjusting compasses the vessel proceeded to the measured mile at Gullane, where a number of runs were taken at high speed under somewhat unfavourable circumstances as to weather. With the engines working easily, however, a speed of 13½ knots was obtained, which is above the highest speed of the other vessels on the line. The *Weimar* has been built specially for the passenger service between Leith and Hamburg, and in her first-class accommodation, which is forward, there are, besides a special saloon and ladies' cabin, state rooms for about 50 passengers, all fitted up in very handsome style. In addition to this the steamer has space for about 200 second and third class passengers. The *Weimar* is about 1,550 tons gross, and has all the latest appliances for working cargo expeditiously. The engines are triple-expansion, and at the trial indicated about 1,350 H.P.

**Persis.**—On February 18th the steamship *Persis*, built by Messrs. Mackie & Thomson, Govan, to the order of Messrs. Aitken & Walker, Glasgow, went down the Firth of Clyde with a select company on board. The steamer, which has been built for general trading, carries about 3,000 tons deadweight, and her design and finish reflect the greatest credit upon her builders. The engines are by Messrs. Muir & Houston, Kinning Park, of the triple-expansion type, and these are the third set made by this firm for the same owners. The speed attained was 11½ knots on the measured mile, and everything in the engine department worked most satisfactorily during the trip. Mr. T. L. Neish was the owners' superintendent under the contract.

**Eugenie.**—On February 19th the s.s. *Eugenie*, launched a few weeks ago from the shipbuilding yard of Messrs. Richardson, Duck & Co., for Messrs. Burdick & Cook, London, was taken to sea for a trial of her machinery. The engines (triple-expansion) by Messrs. Blair & Co.; Limited, have cylinders 21½ in., 35 in., and 57 in. by 36 in. stroke, 1 double-ended boiler, working at 160 lbs. pressure. The machinery worked very satisfactorily during the trial, but owing to the heavy sea no speed results could be obtained. Afterwards the vessel proceeded to Barry Dock to load for Malta. The company on board included Messrs. Burdick & Cook (owners) and E. Cockerel, all of London.

A REMARKABLE feat was recently done in the United States, in connection with the erection of Cairo Bridge, over the Ohio River. This bridge is nearly four miles long, with three main spans of 518 ft. each. One of these spans was erected so as to be self-supporting in three consecutive days, an unprecedented feat in bridge engineering.

We are informed that the Elmore Copper Depositing Company have commenced the manufacture of copper tubes at their Leeds works.

**Liquid Fuel.** By E. A. Brayley Hodgetts. (E. and F. N. Spon, 125, Strand, London.)

ARTIZ the great interest that has been, and is now being taken in the subject of the use of liquid fuel for steam evaporating purposes, we must welcome this little treatise as forming an excellent compendium of the subject. The author, however, modestly claims only for this book that it is rather a compilation than an original work, but, however the matter may have been collated together, it contains, in its present form, just the information that is desired by those who are interested in the subject. "Liquid Fuel," particularly referred to, is the heavy residual oil left in the still after the burning oil has been taken off, constituting about 60 per cent of the original charge. This residual oil has been used in Russia very successfully for years past, for whilst Western Europe and the U.S.A. have been experimenting upon boiler furnaces, the steamers on the Caspian Sea and adjoining rivers have practically solved the problem. The abundance of petroleum, and the comparative scarcity of coal have jointly contributed to stimulate inventions there. The general adoption of liquid fuel is only a question of cost as compared with coal. Practically a generator fed with petroleum should in a well-built furnace burn only one ton of liquid as against three of solid coal, for the same evaporation, hence, there is an excellent margin for economy even at a moderately high price for liquid fuel. It should also be remembered that a ton of oil refuse takes up little more than half the space of a ton of coal, and this in the question of storage will make a marked difference. We find very detailed and illustrated information as to the best class of hearth furnaces, wherein spray furnaces, including pipe sprinklers and nozzle sprinklers are used. The arrangements are profusely illustrated and explained, as also their management and action. A complete chapter is devoted to the methods of working "sprinklers" so that the reader may not only find information as to how such furnaces should be constructed, but also practical information as to how they should be managed. In conclusion, the particulars as to the many industrial applications of liquid fuel will be of great interest as serving to show what has already been successfully effected in these processes, and also serving to light the way by the results of experience to further industrial applications.

**Turning Lathes.** A Manual for Technical Schools and Apprentices. Edited by J. Lukin, B.A. (Britannia Co., Colchester.)

In the interests of the many amateurs and apprentices who are now studying the engineering profession, such a little book as this will prove of great interest and value. The object of this work is to give a description of the lathe and tools to be used with it, in a series of chapters and the necessary information to amateurs and apprentices as to how to affect certain classes in a good and workmanlike manner. The subject-matter is profusely illustrated, showing the form of the tools and appliances, and the method in which the tools should be applied to effect certain specific work. Hardwood and boxwood are subjects of information, giving the peculiarities of treatment suitable to each. Then follows information as to all forms of hand turning and slide-rest work, in metal, which is the ultimate outcome of more properly engineering work, which is fully discussed, and we are glad to see what due importance is attached to the proper cutting angles of the tools to be employed. It is no secret in an engineer's works that the amount and quality of work turned out by any turner is almost entirely dependent upon his knowledge and attention to the proper cutting faces of the tools he uses. The mysteries of screw-cutting to any required number of threads per inch on the self-acting lathe is fully gone into and explained, with the addition of convenient tables of change wheels for reference in actual practice. The very useful art of metal-spinning is not forgotten as a branch of turning, and the ornamental drill and eccentric cutter is explained in great minuteness. In conclusion, attention is drawn to one of the latest developments of mechanical processes, viz., that of "milling," and it is shown how easily an ordinary lathe, with special fittings, may be adapted to this all-important process. The whole manual forms a very concise and exhaustive treatise in the art of turning for any amateur or apprentice if supplemented as it is intended by practice at the same time.

## Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

### FORCED DRAUGHT.

To the Editor of THE MARINE ENGINEER.

SIR,—Enclosed I beg to forward you a letter written by my late brother, Mr. G. A. Cates, marine engineer, in answer to Mr. Williams's letter, published in your journal of the 1st inst.

May I ask you in justice to his memory, as he is now unable to speak for himself (he having died suddenly just at the moment of concluding the enclosed), to kindly insert it in your next publication, if at all possible; if not, please do so in the following one.

By so doing you will greatly oblige me, as my brother's memory is too dear to me for Mr. W.'s letter to remain unanswered.

I remain, sir,  
Yours respectfully,  
W. CATES,  
Ship Broker.

18, Queen Square, Bristol, January 28th, 1890.

To the Editor of THE MARINE ENGINEER.

SIR,—Kindly allow me a little space to reply to the remarks of Mr. J. Williams in your last in reply to my letter to you of December.

Mr. W. displays an amount of invective and verbal ingenuity more characteristic of a heated partisan than the tone of a scientific reviewer, and if he could not deny the accuracy of the few historical facts quoted by me, I think it would have been more complimentary to the great experience of the majority of your readers to have abstained from misleading insinuations and statements not warranted by facts, and to form a true estimate of which the December and January numbers of your journal should be read together.

It is incorrect and misleading to state that I ever attempted to make an airtight fire-door for forced draught, or that my system and plans are similar to, or can be identified with the mistakes and failures of others as quoted by Mr. Williams.

It will be seen in my last that I pointed out the failures on record of those who attempted to make an air-tight fire-door, with a closed ashpit, with a pressure in the furnace above the atmosphere, and that by my system the issue of flames and gases from the furnace under pressure with a closed ashpit is prevented by not having an airtight fire-door, and that no injury could result from the opening of the door as by the slightest movement of the door the blast would be instantly shut off.

It is a misleading insinuation that I stated that the burning of 100 lbs. of fuel per foot of bar was an achievement of Mr. Fletcher's, but I repeat that it is on record that 138 lbs. of fuel has been burned per foot of grate bar upon the Fletcher or closed stokehold system without the disastrous results of melting the doors as supposed by Mr. W., and which he should have known before attempting to instruct other people in the mysteries of forced draught, and to characterise as absurd that which he could not understand.

Imitation is considered the most sincere form of flattery and approval, therefore I ought to feel gratified that in all successful attempts of forced draught without a closed stokehold subsequently to 1882 every detail of my system as shown in 1883, even to the relative distances of the fire bars and thickness of the same, has been closely imitated, or else the casing system of Messrs. Willan's has been successfully followed, therefore if there is any absurdity, it is in Mr. Williams's

Mr. Williams's  
tione?  
W.  
K.

s paper read before the engineers, men-  
nd assignment of the mantle of Mr.  
urning notoriety, both gentlemen being,  
a same principalty; but whatever value

the original garment possessed, and I perfectly recollect the conflicting opinions upon the subject that were rife forty years ago, is at this period (and long since) generally acknowledged to be a very tattered and patchwork affair, and, as an habili-ment for a modern engineer, not of much value.

In my last to your journal I only pointed out that which had been done in forced draught previously, without disparaging the inventions of anyone, and not covered by Mr. W.'s paper, read at the institution, which paper many considered should have been a careful review of an important subject, instead of being confined to the description of the work of one manufacturer.

In taking my leave of Mr. Williams I must tender him my best acknowledgments for his patronising and obliging willingness to reward me according to my deserts; but, as Mr. W. is not yet an engineering authority, much less a high priest of that temple in which, under happier circumstances, it seems he would not have objected to my occupying a humble position, I may perhaps be forgiven if, under the circumstances, I do not feel the position as acutely as he would expect, by my not coming down to his standard of excellence.

I am, dear Sir,  
Yours faithfully,  
G. A. CATES,  
Marine Engineer.

### S.S. "METEOR."

To the Editor of THE MARINE ENGINEER.

SIR,—The enclosed copies of diagrams, taken from the engines of s.s. *Meteor* at sea, on 19th Dec. last, will, I have no doubt, be of interest to many of your readers. In your issue of June, 1889, you publish the full report on the engine trials of the s.s. *Meteor*, carried out in June, 1888, by Professor Kennedy and staff, while on the voyage from Leith to London, the diagrams then taken were not at full power, more so, the full power astern ones, they being taken when the engines were put full speed astern for a minute or so, when going up London river.

The enclosed diagrams were taken at sea, with the engines going full power ahead, they were then stopped and put full power astern for twenty-five minutes, before the astern-going cards were taken, the particulars of both you will find fully detailed on accompanying tracings.

The power of the H.P. engine when going ahead, being more than when going astern, is due to the valves being altered on the ahead going gear to bring the power of H.P. engine up (it being the middle engine), so that I.P. or forward engine would not exert more power than the middle engine. Some notice was taken by your correspondent "D. R." in your December number regarding the sequence of the cranks (they being, 1, 2, 3 going ahead, and 1, 3, 2 going astern), to whom the diagrams will be of interest, and also to many others.

Trusting you will find space to publish them,  
I am, yours truly,  
RICHARD YOUNG,  
Superintendent Engineer.

Leith, February, 1890.

### FAST PASSAGES.

To the Editor of THE MARINE ENGINEER.

SIR,—I have been reading the correspondence going on in your paper for the last two months on the above subject with no little interest. I think "W. L. P.," in the February number seems to have gone a little too far in his zeal to push his profession to the front. Allow me to quote his concluding sentence: "All our puny efforts are, at best, as those of ants in the great work of life, but I, for one, cannot repress the conviction that ere this planet of ours has become a century older, the future historian of the progress of marine propulsion will entertain his students by an allusion to the antiquated incongruity of placing an unscientific and perchance wholly illiterate man in supreme control, as an amusing illustration of the primitive methods in vogue during the nineteenth century." Now to talk of our sea-captains as unscientific and wholly illiterate is simply nonsense. A sea-captain has to pass a Board of Trade examination, and gain a certificate in exactly the same way as an engineer, though, of course, not in the same subjects. I am not a sea-captain myself, and I don't

## S.S. "METEOR."

Draft Forward 15ft. 2in.

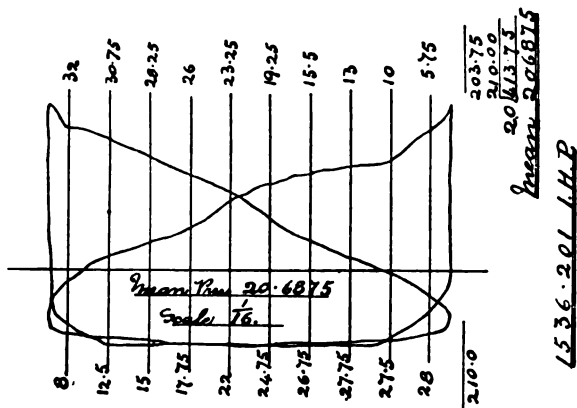
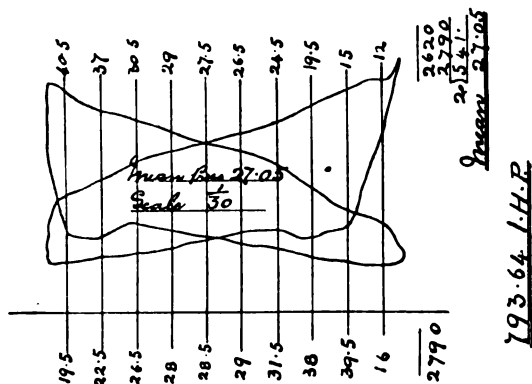
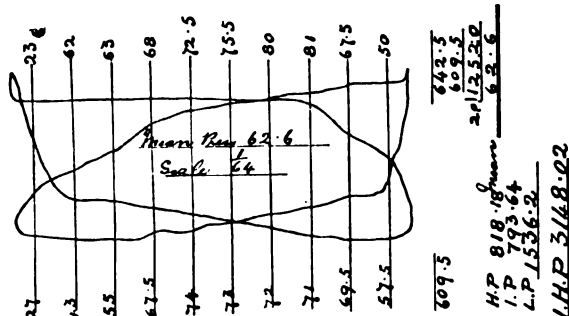
Aft. 16ft. 8in. = Mean. 15ft. 11in. = 2240 Tons displacement.

Sequence of Cranks—Going Ahead.

Sequence of Cranks—Going Astern.

H.P. I.P. L.P.

H.P. L.P. I.P.



AHEAD.

Cylinders, 29 $\frac{3}{4}$ , 44, 70.

Stroke, 48in.

Steam, 150lbs.

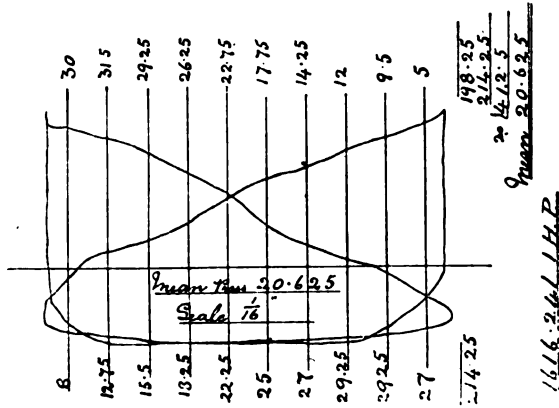
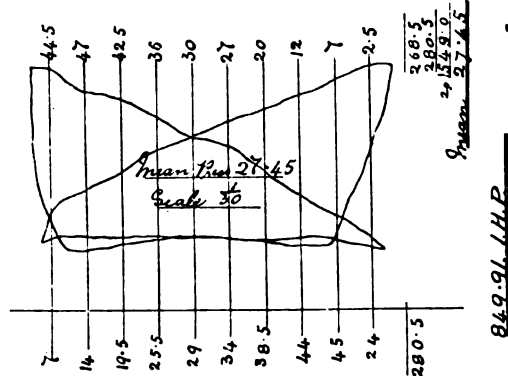
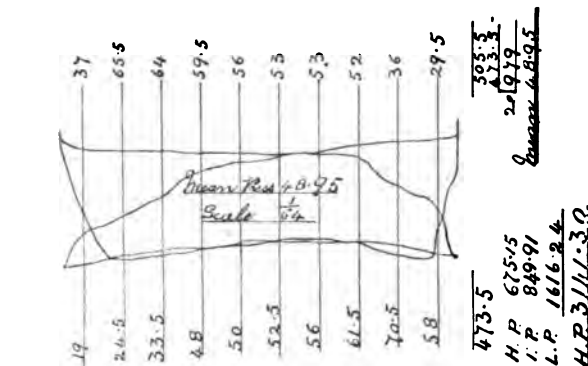
Vacuum, 25in.

Revolutions, 84.

Mean Pressures, 48.95, 27.45, 20.625.

I.H. Powers, 675.15, 849.91, 1616.24.

Total I.H. Power, 3141.30.

Scales,  $\frac{1}{4}$ ,  $\frac{1}{50}$ ,  $\frac{1}{6}$ .Average Speed at full power = 16 $\frac{1}{2}$  knots.

ASTERN.

Cylinders, 29 $\frac{3}{4}$ , 44, 70.

Stroke, 48in.

Steam, 150lbs.

Vacuum, 25in.

Revolutions, 79.6.

Mean Pressures, 62.6, 27.05, 20.6875.

I.H. Powers, 818.18, 793.64, 1536.2.

Total I.H. Power, 3148.02.

Scales,  $\frac{1}{4}$ ,  $\frac{1}{50}$ ,  $\frac{1}{6}$ .

Engine was going astern at full power for 25min. diagrams were taken.

suppose I ever shall be, I have not even a "sister, or a cousin, or an aunt" in the profession, but I must say from what I have seen of them, and I have come across a good many, that sea-captains are a most respectable and steady class of men, and by no means unscientific or illiterate, while those at the head of their profession in charge of our great ocean liners are equally remarkable for their genial good nature and hospitality. The letter by "B. W. G.," in the January number, I consider the most sensible of any that have appeared yet, and his simile of the fable of the belly and members most appropriate. Why should the engine-room try to stir up bad feeling against the bridge? I think we can find one reason for it in "W. L. P.'s" letter; when he talks about "the nominal usurper of the real responsibility arrogantly stepping the bridge with white hands and brass buttons," he seems to be affected with a touch of jealousy which does not sound at all well from such an enlightened and advanced member of society as an engineer. Surely it would be best if, as "B. W. G." suggests, each should do his duty to the best of his ability without reviling his brother officer, for neither could get on very well without the other. By all means let the engineers get their due, for they certainly have a hard enough time of it occasionally, and "W. L. P.'s" graphic picture of them down in the bilges clearing the pumps is quite pathetic. But the captain has also his anxiety and responsibility. In times of fog or storm or when the engines break down, the engineers are at fault, and the vessel drifting on to a lee-shore, whose is the anxiety then, and whose the blame if lives or property are lost?

I am, Sir,

Yours, &c.,

P. W. N.

February 11th, 1890.

## BOARD OF TRADE EXAMINATIONS.

NOTE.—1 C, denotes First Class; 2 C, Second Class.

### EXTRA FIRST CLASS.

January 25th, 1890.	Cotton, W. D. ....	E1C N. Shields.
" "	Stewart, S. T. ....	E1C "
February 1st "	Hutchison, Jas. ....	E1C Leith
" "	Hulme, W. G. ....	E1C "
" 8th "	McDonald, D. ....	E1C "

January 25th, 1890.

Alderson, G. A. 1C W.Hrtipl	Andrew, W. H. 2C Sunderl'd
Black, Hugh .. 1C London	Biggam, D. H. 2C Liverpool
Burnet, Geo. .. 2C Glasgow	Beakey, J. .. 2C Sunderl'd
Barrowes, S. J. 2C Cork	Bunton, Jno. E. 1C "
Cochran, James 2C Glasgow	Coverdale, R. E. 2C "
Dunn, Wm. .. 2C London	Cross, Roger .. 2C Liverpool
Forrest, Wm. 2C Glasgow	Donald, James 1C N. Shields
Gale, Wm. .. 2C London	Darward, J. L. 1C London
Gerrie, Wm. H. 1C Aberdeen	Douglas, James 1C "
Glassford, John 1C Liverpool	Greig, Geo. T. 1C "
Harvey, James 2C Glasgow	Harcus, John. 1C N. Shields
Hildreth, T. M. 2C W.Hrtipl	Hargrave, W. H. 2C "
Hunter, Ewing 2C Glasgow	Head, George 2C Hull
Hutchison, W. R. 2C W.Hrtipl	Jennings, Geo. 1C Sunderl'd
Hutchinson, C. 2C Liverpool	Jupe, Wm. T. 1C "
Kelly, Wm. J. 1C "	Kirkham, Thos. 2C N. Shields
Kelson, G. F. R. 2C London	Laws, Jno. Geo. 2C Sunderl'd
Law, James .. 2C Glasgow	Lewis, T. R. .. 2C Liverpool
Longwell, Jas. 2C "	Reynolds, W. H. 2C London
Macpherson, A. 2C "	Sanderson, Jno. 2C N. Shields
McDougall, Jas. 2C Liverpool	Stafford, Wm. 2C "
McKean, Arch. 2C Glasgow	Sutherland, A. G. 2C "
Mitchell, Chas. 1C "	Tanfield, Wm. 2C Hull
Old, Richard .. 1C W.Hrtipl	Thompson, J. W. 2C N. Shields
Radford, Thos. 2C Liverpool	Wylie, Saml. J. 2C Sunderl'd
Russell, John .. 1C Aberdeen	
Selby, James .. 2C London	February 8th, 1890.
Sorensen, A. M. 1C Glasgow	Adam, James .. 2C Glasgow
Stewart, Gilbert 2C "	Arbuckle, M. .. 2C London
Taylor, Thos. M. 2C "	Bartlett, James 2C Leith
Walliker, J. G. 1C London	Blight, John W. 2C Cardiff
Wright, Geo. K. 2C Liverpool	Brown, John .. 2C N. Shields
Wright, Wm. .. 2C London	Buchanan, R. D. 1C Greenock
	Burt, W. .. .. 2C London

Colville, Wm. .. 2C Glasgow	Stewart, J. .. 1C N. Shields
Crawford, Thos. 2C "	Thompson, M. E. 1C Hull
Crawford, James 2C London	Thomson, Wm. 2C London
Cupit, James, E. 2C Liverpool	Vevers, Jno. .. 2C Hull
Curry, Robt. T. 2C N. Shields	Williams, Jno. .. 2C Glasgow
Denby, E. T. .. 2C Cardiff	Wright, Jno. .. 1C "
Duggleby, W. H. 2C Hull	February 15th, 1890.
Durkee, J. E. .. 1C Cardiff	Bainbridge, T. 1C W.Hrtipl
Ellywood, Thos. H. 2C Hull	Berrill, Thos. R. 1C Liverpool
Faragher, James 2C Liverpool	Bond, Henry .. 2C "
Fergusson, J. M. 1C Glasgow	Bradburn, F. E. 2C "
Fletcher, S. .. 2C N. Shields	Burns, Conway 2C Plymouth
Gardner, John 2C London	Clay, George .. 1C W.Hrtipl
Gardner, Robt. 2C Glasgow	Crowell, Jno. J. 1C N. Shields
Gordon, Jno. .. 2C London	Dalglish, Wm. 1C Dundee
Hamili, N. .. 1C Liverpool	Dotchin, Jno. A. 1C N. Shields
Harper, Geo. .. 1C Leith	Easton, Fletcher 2C "
Heron, A. G. .. 1C Liverpool	Edmonstone, J. 2C Dundee
Hewitt, Wm. C. 2C "	Edwards, C. A. 1C N. Shields
Jones, Rich. D. 2C London	Evans, John J. 1C Liverpool
Knight, Arthur 1C Cardiff	Francis, Jno. J. 2C "
Low, Jno. .. 2C Leith	Hall, Alex. .. 2C Dundee
Malcolm, Henry 2C Greenock	Harrison, Jos. W. 2C Liverpool
McCoull, G. .. 2C N. Shields	Hendry, James 2C Dundee
McIndeor, Mal. 2C Glasgow	Hasletine, G. R. 1C W.Hrtipl
McLay, David 1C Leith	Holman, Hugh 1C London
McLellan, Robt. 2C "	Hoy, Wm. .. 2C W.Hrtipl
McNair, Jno. .. 2C Glasgow	Hughes, Frank 1C Liverpool
Meldrum, And. 2C Leith	Main, James F. 2C N. Shields
Morrison, Wm. 2C "	McRae, Joseph 2C "
Murray, Alex. 2C Liverpool	Meredith, George 2C Liverpool
Parkington, J. D. 1C "	Osbon, Fred. H. 2C W.Hrtipl
Price, Rich. .. 2C London	Pottic, Geo. M. 2C Liverpool
Richards, D. G. 1C Cardiff	Sanderson, C. P. 2C N. Shields
Richardson, R. 1C Leith	Skinner, Jno. G. 2C "
Ross, Andrew .. 2C Liverpool	Struthers, Robt. 1C London
Rushton, Jno. .. 1C Leith	Summer, Thos. .. 1C Liverpool
Scarth, P. .. 2C London	Vincent, Robt. .. 2C N. Shields
Scott, Harry .. 2C Leith	Warley, John S. 2C W.Hrtipl
Smith, David .. 1C Greenock	Wright, Francis 1C Liverpool
Smith, James .. 2C Glasgow	Wyllie, John .. 2C Dundee
Smith, Thos. B. 1C Cardiff	Yule, Thomas .. 2C "

## Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships from January 21st to February 22nd, 1890.

1499	C. Stiles. Lubricators.
1523	S. Mace. Ascertaining, &c., a ship's draft and trim.
1571	J. B. Edmiston. Filtering feed-water for steam boilers.
1679	G. Tweedy. Steering apparatus.
1686	C. W. Burton. Combined air-compressors.
1693	W. Tomkins. Marine propellers.
1724	G. W. Sivewright. Floor plates and keelsons.
1726	P. Haden and H. H. Bales. Lubricators.
1847	O. Meredith. Tubes for steam-boilers.
1858	C. Arnold and H. Arnold. Boilers.
1904	T. W. Cole and G. Waller. Steam-engines.
1958	M. H. Robinson. Steam and other valves.
1961	J. G. H. Batchelor. Preventing the deposition of soot in boiler tubes.
1991	H. Lamb. Thrust blocks.
2076	A. Horton. Apparatus for showing vertical positions in ships.
2165	A. Pullar. Water gauges and gauge cocks.
2186	E. Morris. Reversing valves.
2217	R. Marshall and E. Fitz-Gerald. Steam generators.
2218	R. Marshall and E. Fitz-Gerald. Surface condensers.
2278	The Western Coil and Pipe Cleansing Co., by Rufus W. Applegarth. Water coil and pipe cleansing boilers.
2292	A. Brown. Elevating steam-vessels.
2349	T. Metcalf. Cut-off mechanism for slide valves of steam engines.
2372	A. J. Boulton. Valves (S. C. McNeill and P. Clarke, Canada).
2392	J. T. March and T. S. Trust. Rotary propellers.
2456	J. Desmond. Steam injectors.
2479	J. H. DeMattos, F. E. DeMattos and E. A. F. T. DeMattos. Propelling ships.









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